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Cover and Designs.....Martyl

In This Issue

A Message from Albert Einstein.....354

New Life for the UNAEC.....355
by David F. Cavers

The Next Phase of the International Control Discussions 359
by Edward A. Shils

The Atomic Deadlock Could be Broken—A Symposium 363
by E. M. Friedwald, N. F. Mott, M. L. Oliphant and H. C. Urey

Science and Politics in Russia.....368
by L. C. Dunn

The Crushing of Genetics in the USSR 369
by H. J. Muller

Letter to the Editor 372
by Sir Alfred Zimmern

Science and Security 373
by Karl T. Compton

The Atom Bomb as Policy Maker.....377
by Bernard Brodie

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A Letter From Albert Einstein

Dear Reader:

The Emergency Committee of Atomic Scientists was organized in August 1946 to support the educational activities undertaken by the various groups of atomic scientists. From the beginning, one of the important activities supported by the Emergency Committee has been the Bulletin of the Atomic Scientists, a magazine founded by the Atomic Scientists of Chicago, three years ago this month, and devoted to public education on atomic issues and related fields.

The developments of the last two years have made it plain that the education of mankind toward a clear understanding of the implications of atomic energy, and full appreciation of the dangers and hopes inherent in new discoveries, is a long-range task which cannot be solved on an emergency basis. The Editorial Board of the Bulletin and the Emergency Committee have agreed that the best way to provide the Bulletin with a broader and more permanent basis for the continuation and widening of its activities is through the organization of a permanent Sponsoring Committee, representative of the American scientific community. The distinguished list of scientists—physicists, chemists and biologists—who have agreed to become members of this committee, is a testimony that the Bulletin, in the three years of its existence, has become established as a representative organ of this community. It has become widely recognized in America and abroad, both as the best and most complete source of authoritative information on the social aspects of atomic energy, and as a forum for the discussion of the relevant problems, open to all points of view held in this field by American and foreign, natural and social scientists.

However, despite this success, the problem of putting the Bulletin on a stable financial basis remains. In transferring its sponsorship of the Bulletin to the new Committee, the Emergency Committee wishes the Bulletin continued success in its important work, and appeals to all who have in the past supported the Bulletin by their donations to the Emergency Committee to continue and strengthen this support by contribuions to the Bulletin.

Yours sincerely,

Albert Einstein

Chairman, Emergency Committee of Atomic Scientists

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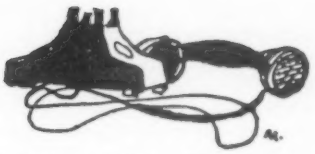
NEW LIFE FOR THE UNAEC

David F. Cavers



Two contributors to this issue, Dr. Cavers and Mr. Shils, consider how the UNAEC may yet accomplish constructive work during the extended span of life conferred upon it by the insistence of the small nations at Paris. Dr. Cavers, a member of the Faculty of the Harvard Law School, sees in the exploration of concrete problems a hope of reconciling divergent views on atomic energy control. He outlined a previous suggestion for resolving the control dilemma in "Atomic Power Versus World Security", BULLETIN, Vol. 3, No. 10.

The General Assembly's refusal to authorize euthanasia for the UN Atomic Energy Commission prompts the question: "What can the members usefully talk about?"

If both sides are going to adhere resolutely to their present positions, come what may, then, of course, the Assembly's action is destined to futility. But can we be sure that this will happen?

The record of the Commission's past endeavors reveals grounds for discouragement aplenty and grounds, too, for doubting the Russians' desire to agree. But an objective reading of the record does not compel the conclusion that the Commission had exhausted all the potentialities for satisfactory compromise.

Faced by the Russians' consistent refusal to accept the control technique outlined by the Commission majority in the First and Second Reports and also by the Russians' failure, despite protestations to the contrary, to allow their counter-proposals to be developed into more effective measures, the Commission cut off its work before it had reached the brass-tacks problem involved in the application of its own control plan.

This was a natural, a "logical" step, but, as a result, the Commission's plans, despite their apparent specificity, remained plans "in principle" at many basic points. This is significant in the light of the familiar fact that nothing is harder to compromise than a principle—until the matter of application is reached. If, when principles are in conflict, attention can be shifted from broad abstractions to concrete matters of application, the actual gaps that divide the disputants are often discovered to be narrow enough to be bridged by compromise.

There are three major problems involved in the application of its control plan that the Commission left virtually untouched, namely:

(1) The application of the principle of strategic balance (and, linked closely to it, the application of a second important though little recognized principle which I shall call "the principle of minimum use").

(2) The application of the principle of stages in the introduction of controls.

(3) The application of the principle that sanctions against violations of the control plan should not be subject to veto in the Security Council.

What Success Can Be Expected?

The first of these problems, though potentially very controversial, seems not to have been the subject of extended discussion, much less controversy. On the second, there was a continuing clash, but on the level of principle only. On the third problem, the Russians and Americans remained intransigent in disagreement in principle. Apparently no extended consideration was devoted to the very promising line of reconciliation which Foreign Minister Herbert V. Evatt of Australia suggested in July, 1946, when chairman of the Commission.

Perhaps an attempt to press further in considering these problems would be rendered futile by an abstention of the Russian and satellite delegates from the discussion. This seems unlikely, though doubtless they will continue their exasperating practice of insisting that issues of principle be settled first while at the same time chiding us for our unwillingness to examine questions concretely.[1]

If work on the three problems were firmly persevered in and, as it progressed, areas of potential agreement began to broaden, then new possibilities would almost certainly open up for solving the one problem that the Commission has extensively examined—the technique of control—and so pave the way to complete agreement. Even then, however, one would have to reckon with the possibility—or, to be more realistic, the probability—that complete agreement on all the problems of control at the Commission level would not lead to acceptance of the control plan by both sides if the present degree of political tension between the Western and the Soviet blocs should persist.

This is a depressing contingency, but not one to be side-stepped. If, for example, a control plan depends for its effectiveness on a considerable measure of trust among nations, then the final judgment whether the requisite degree of trust exists is of the highest political order, and not for the Commission. On the other hand, the Commission need not close its eyes to the existence of reciprocated distrust; on the contrary, that fact sets the Commission the task of developing a plan which will minimize dependence on mutual trust and will avoid accentuating the present tensions.[2]

There are two reasons why the risk of rejection on political grounds should not foreclose efforts to arrive at Commission agreement on a control plan: (a) If such agreement can be achieved, that very fact would operate to lessen the existing tensions. (b) If the political relations between the blocs should improve more rapidly than now appears likely, the chance to effect a general settlement might

1. A statement by Andrei Gromyko to the Working Committee on March 29, 1948, affords a nice illustration of this practice. After complaining of our unwillingness to examine the stages problem concretely, he goes on to deplore the majority's "tendency . . . to subordinate the political tasks of control to considerations of technical detail" and urges agreement on "key questions of principle" UNAEC, Third Report (May 17, 1948) Annex 5 (a). Andrei Vishinsky more recently complained of the majority's failure to develop the sequence of stages. Statement of UN General Assembly, Political Committee, October 2, 1948, reported in *N. Y. Times*, Oct. 2, 1948, p. 4.

2. In an earlier article, *"Atomic Power versus World Security,"* Bulletin Vol. 3, No. 10, (Oct. 1947), I criticized the majority plan on the ground that, unless qualified by a moratorium on all large-scale facilities, it would not adequately prevent action by a malevolent power and would create many new sources of international friction.

be seriously impaired by the fact that difficult issues in atomic energy control still remained to be attacked. The notion that a general political settlement would make it easy to settle those issues is a naive and dangerous fallacy.

These considerations together emphasize the desirability of a further study of the three problems which the Commission has not yet examined in detail. In the rest of this article I shall point out some of the possibilities for adjustment that might be opened up by such an attack on each of the three problems.

The Problem of Strategic Balance of Facilities

Beginning with the Acheson-Lilienthal Report, the principal safeguard in the control plans against seizure of atomic facilities and stockpiles has been the principle of strategic balance. This principle is formulated in Chapter 5, Specific Proposal XI, of the Commission's Second Report. It requires that facilities and stockpiles be so distributed that no one power would gain a significant military advantage by seizing the facilities and stockpiles held by the control agency within or adjacent to its territory.

The Russians do not seem to have challenged this principle; indeed, the hospitable (though very general) reference of Gromyko to the use of quotas in controlling peaceful atomic activities[3] all but presuppose Russian acceptance of the strategic balance idea which the quotas would implement.

In its Second Report, the Commission introduced a second principle to govern the distribution and operation of production facilities which also was designed to deter seizure. This I shall call the principle of minimum use. It is formulated with respect to operations and stockpiles in Specific Proposal XII of Chapter 5 which reads:

"The international agency shall keep the production of nuclear fuel in a form suitable for ready conversion to weapon use at the minimum required for efficient operating procedures necessitated by actual beneficial uses, including research and development. The agency shall not be authorized to increase existing stocks of nuclear fuel for any contemplated requirement except where it is necessary to produce nuclear fuel for use in facilities whose location, design, construction, and financing have been definitely decided by the agency and the nation concerned."

A limitation on facilities consonant with the principle of minimum use appears in Specific Proposal XI formulating the principle of strategic balance. This states: "(c) Dangerous facilities shall be provided for nations only as world conditions of security warrant and where economic justification exists."

Suppose now that the Commission were to tackle the job of translating these two principles into blueprints for a control convention. What might happen?

Approaching the question of strategic balance, the Commission would have to recognize that the world is not divided into fifty-odd wholly independent powers, each armed against all the others. It would note not only the existence of blocs but also a certain instability in the membership of those blocs. Facilities for producing nuclear fuels would have to be distributed between blocs, but, in view of their great cost, the number of such facilities would be small. If any large plants were to be authorized outside of the United States and Russia, presumably this would have to be done in pairs, and, if so, where would the counter-balancing plants be situated? And, in any case, how far from the border would a Russian plant have to be to constitute the strategic equivalent of Oak Ridge or Hanford?

As these questions were being raised, the Commission would be confronted by its principle of minimum use. Is there any conceivable economic need for large production facilities in Russia, given the present embryonic state of the art of using nuclear fission to produce electric power? What showing of "actual need" would justify their operation and the accumulation of stockpiles of the nuclear fuels they produced?

If, however, the principle of minimum use denied the erection and operations of plants in Russia, then surely the principle of strategic balance would forbid the maintenance of like plants in this country. For that matter, how could the continued operation of plants in the United States be justified on the principle of minimum use, even though that principle, as formulated in the rule applying to facilities, were regarded as curbing only future and not existing facilities?

What emerges from this hypothetical projection of the two principles in the light of political and scientific actualities is the likelihood that an application of the Commission's Second Report would come close to embodying the "zero quota" or "power moratorium" control plan. This plan, it may be recalled,[4] would forbid large-scale stocks of nuclear fuels and facilities for their production to all nations until either the relaxation of international tensions or scientific discoveries eliminating existing hazards made it safe to remove or modify the ban by amendment to the control convention.

Just how close the Second Report would come in actual application to this alternative plan would not depend solely on the considerations of balance and minimum use just mentioned. Another exceedingly important and pertinent question (to which the Commission's report attempts no definite answer) is this: To what extent would the application of the principles of strategic balance and minimum use be specifically determined in the control convention rather than left to the judgment of the control agency by principles declared in the convention. Every grant of discretionary authority to the agency in this vital area naturally is cause for concern on the part of the minority powers.

Extent of Agency's Power Is a Key Issue

The flat prohibitions of the zero quota plan could readily be embodied in the control convention. In contrast, to spell out quantitative limitations on authorizations of large-scale activities would be exceedingly difficult in a hard-to-amend instrument governing a rapidly advancing technology. This the Second Report recognizes.[5] Accordingly, Proposal XI in Chapter 5 declares that the distribution of dangerous facilities and stockpiles shall be determined "in accordance with the quotas, provisions, *and principles* set up in the treaty or convention." (italics mine)

Here clearly is a matter on which further Commission deliberation might

3. In a statement to UNAEC Committee 2 at its 37th meeting, August,, 29, 1947, AEC/C.2/III, App. I, Gromyko said, "It is to be regretted that the question of establishing a system of quotas has not received the required attention" in the Commission.

4. It has been described in the Bulletin for May, 1947; Vol. 3, Nos. 4-5, (Daniel and Squires, "The International Control of Safe Atomic Energy") and for October, 1947; Vol. 3, No. 10, (Cavers, "Atomic Power versus World Security").

5. UNAEC, Second Report (Sept. 1947) Pt. II, Ch 1, "Powers and Functions of the Agency" (b). It should be remarked, moreover, that the security achieved by a nice balancing of facility and output quotas in the convention depends on the perpetuation of the political alignments in existence at the time the convention was signed.

do much to advance agreement. If the Commission concluded that its two principles precluded large-scale facilities, operations and stockpiles, then this decision could be embodied in the convention, and thus the need for vesting discretionary power in the control agency would be eliminated.

By this single step some other sharp points of disagreement between majority and minority would be wiped out. Thus the issue of ownership and management versus periodic inspection of dangerous facilities would be largely done away by the convention's ban on large-scale facilities. The same step would end the risk that a majority in the control agency would exercise its control powers to the detriment of the communist economies—a remote hazard but one much stressed by the Russians. If the control agency's activities were confined to research, development and inspection, mining of ores containing both source materials and other important constituents would remain as almost the sole area of potential economic conflict.

Perhaps the most important contribution to agreement that such a move would make would be in doing away with the risks of diversion and seizure. This would sharply diminish dependence on mutual trust among nations for successful control. The problem of inspection to detect clandestine activities would, of course, remain, although reduced in difficulty. Further Russian concessions on this point are indispensable to effective control. That they might be forthcoming is foreshadowed by Vishinsky's defense in the Assembly on October 2, 1948, of the earlier Russian inspection proposals on the ground that they represented simply "a beginning." [6]

Very possibly, in the brass-tacks consideration of the principles of strategic balance and minimum use, the possibility of providing for some developmental plants for power experimentation would be explored and a plan for maintaining them with limited supplies of nuclear fuels (obtained from our own past production) might be devised.

Such plants would be "dangerous" in the strict sense in which that term has come to be employed, but if they were limited in size, located in exposed areas, and not backed up by large-scale production facilities, the resulting military hazards of diversion and seizure would be minimal. Modified to this extent, a control convention fixing zero quotas for dangerous facilities and uses would probably result in no protracted delay in the eventual large-scale exploitation of atomic energy for power, unless, of course, political conditions were to deteriorate. In the latter event, humanity would have reason to be thankful for the zero quotas.

The Problem of Stages in the Establishment of Control

The problem of stages—the question of who is to trust whom, when and to what extent—long seemed to be at an impasse. Russia's insistence that this country join in a treaty prohibiting the use of atomic bombs and their possession as well, without the assurance that an effective control plan had been set up, was, in effect, a highly unrealistic demand for unilateral disarmament, but it had great propaganda value. Our not unnatural resentment may explain our evident disinclination to discuss the difficulties involved in working out a schedule of stages in concrete terms, a disinclination which Russian propaganda has also fully exploited.

Now, however, Vishinsky states the Russians are ready to enter treaties forbidding atomic bombs and establishing control plans simultaneously.[7] This breaks through the impasse only in the sense that it transfers the problem to the more realistic one of determining a time schedule not for the signing of the treaties but for actual compliance with the treaties' requirements.

Vishinsky insisted in the Assembly on October 2, 1948, that the control plan become effective at all levels of production and use simultaneously.[8] Unless only formal effect is intended, this appears at first blush to be nonsense for the processes involved necessarily extend over time. However, if, on this point, the Russians were interested chiefly in saving face, then it would be possible to make compliance with the control plan effective at all stages simultaneously simply by providing for investigations to be made preliminary to the effective date of the controls. On certification by the investigatory staff that conditions at all levels were consistent with the plan requirements, then the plan could go into effect both formally and actually.

How rapidly could the prohibition on the possession of atomic weapons be made effective? In this connection, it is important to recall that the draft convention to outlaw atomic weapons which the Russians submitted on June 19, 1946,[9] gave to any power possessing them a period of three months in which to dispose of its supply. If, for example, the effectuation of the control plan would require four, six, or even eight months, the gap between the two periods would not seem to be unbridgeable. Certainly the issue merits brass-tacks discussion.

At this point, moreover, it should be noted that the problem of stages might be affected very importantly by the resolution of the stategic balance and minimum use problems. Suppose a facing of the facts had led to the conclusion that no large-scale facilities or stockpiles could be justified anywhere until change in political or scientific conditions would permit changes in the control conventions. Then we should have to accept the necessity of demolishing our own large-scale facilities and all our nuclear fuel save such small amounts as might be preserved to produce radioactive isotopes for research and medical therapy and perhaps to permit small-scale developmental work on the atomic power problem. It might then be possible to make demolition concurrent with the institution, or an early stage, of a control plan, deferring the revelation of key scientific and engineering knowledge till the control plan had been shown to be fully effective.

I refer to such an arrangement not to advocate it but merely to show, first, how the possibilities of reaching secure and equitable agreements enlarge once the stages problem is shifted from the domain of principle to the practical level of scheduling operations that must extend over time and, second, how closely the problem of stages is related to the substance of the control plan.

The Question of the Veto

When Bernard M. Baruch submitted the American control plan to the Commission at its first session on June 14, 1946, he declared "There must be no veto to protect those who violate their solemn agreements not

6. See Satement by Andrei Vishinsky, *supra* note 1.
7. *Ibid.*
8. *Ibid.*
9. Reprinted in UNAEC, Third Report (May 1948) Annex 3 (a), Art. 1 (c).

to develop or use atomic energy for destructive purposes."[10] Since the veto had already emerged as a point of division between the Western Powers and Soviet Russia, it was not surprising that, soon after Baruch's speech, his views were attacked on June 19 in counterproposals offered by Gromyko who warned against "attempts to undermine the principles . . . of the activity of the Security Council, including unanimity of the members of the Security Council in deciding questions of substance . . . Such attempts must be rejected."[11]

The issue thus formulated has never been resolved, although the protagonists of the respective views have frequently reiterated their positions. However, there is little evidence that they have realistically examined the significance of these views in the light of the enforcement problems that would actually face the control agency, despite the efforts to this end initiated by Foreign Minister Evatt of Australia.

In a memorandum to the Commission on July 8, 1946,[12] Evatt asserted that "it is almost impossible to see how the functions and powers of such an agency [the control agency], working as it would in a defined and limited field, could come into conflict with the exercise by the Security Council of the functions and powers conferred" on it by the UN charter. He noted that the Council's jurisdiction could be invoked only in the case of a dispute likely to endanger peace or security and in a case involving the application of sanctions upon proof of a threat to peace.

These sanctions, Evatt pointed out, were far different from the measures that the control agency might invoke if, in the course of its day-to-day operations, it encountered non-compliance with its controls. Hence only when a dispute over compliance reached the level of danger that involved a threat to peace would there be occasion to invoke the jurisdiction of the Security Council.

The Russians have recognized Evatt's position to a very limited degree. They admit the principle of majority rule in the day-to-day operations of the control agency[13] but they firmly adhere to the position that the Security Council alone should have authority to take decisions on sanctions—even in the case of "minor sanctions," as one of the British questions of August 11, 1947, rather unhappily posed the issue.[14]

The line between day-to-day operations in the control agency on the one hand, and the determination of violations and the application of sanctions, major and minor, looks clear-cut when discussion is on the level of principle. But its sharpness begins to blur when questions are translated to the level of actual operations. Not until discussion of the problem has been brought down to this level and the concrete questions that are likely to arise are thoroughly canvassed will it be possible literally for the spokesmen of the respective groups to know just what they have been talking about.

Consideration of Specific Cases Is Highly Desirable

It is rather surprising that the major innovations in international organization which the American and even the Russian control plans contemplate should have been subjected to so little systematic scrutiny from the legal standpoint. And by that I do not mean scrutiny in terms of a penetrating analysis of the nebulous concept of sovereignty. I mean an examination of the brass-tacks types of questions that have to be resolved when any regulatory agency is created but which, in this situation, are presented in an almost unique international context.[15]

If the Commission were now to authorize a study of the problems of prohibitions and enforcement in the context of agency operations, it would enable us for the first time to visualize world government in action, however limited the scale and however hedged by restrictions. Moreover, this study would not have to await a prior determination either of the character and extent of the operations to be permitted under the control plan or of the nature of all the controls to be applied. Nearly all the plans that have been considered present essentially the same kinds of enforcement problems. Thus, eliminating large-scale facilities and operations would not greatly change the kind, though it would materially reduce the number, difficulty and danger, of the problems that the control agency's enforcement machinery would have to handle.

When the issues before the conferring powers have been worked out in concrete terms, some settlement along the line of Evatt's proposal may appear to be feasible. Perhaps an inspired "clarification" of the distinction between operational decisions and sanctions will leave the majority satisfied that the control agency would have sufficient autonomy to do its job (a matter of very practical importance) while the Soviet bloc would find no impairment of the principle of unanimity in the Security Council.

Some concession by the United States on the latter point seems indispensable to any such agreement.[16] And before one rejects this notion as fatal to effective control, the following case must be considered:

Suppose a nation possessing the veto power has been detected violating the control treaty on a scale constituting a serious threat to peace. Compare that nation's situation under the veto and under majority rule. Assume in both cases that a majority of the Security Council votes a sanction. In the first case, the offending nation has a choice between submitting to the sanction or exercising the veto, knowing that the latter choice may lead to war. In the second case, the offending nation also has a choice, the choice between submitting to the sanction or rejecting it, knowing that the latter choice may lead to war. Does this difference seem vital?

10. UNAEC, Verbatim Record, First Meeting, AEC/PV/1, reprinted as Appendix No. 1 to UNAEC, First Report (Dec. 1946), U. S. and UN Report Series 8 (U. S. Dept. of State) cf 81, 86.

11. UNAEC, Verbatim Record, Second Meeting, AEC/PV/2, reprinted as Appendix No. 22, International Control of Atomic Energy, Growth of a Policy (U. S. Dept. of State) 209, 216.

12. Analysis of the Relationship between Organized Measures for the International Control of Atomic Energy and the United Nations Organization (Particularly the Security Council), submitted to UNAEC Working Committee, July 8, 1946, reprinted as Appendix No. 21, International Control of Atomic Energy, *supra* note 11, at p. 204. For the United States reply, see U. S. Memorandum No. 3, July 12, 1946, Appendix No. 16, *id*, at p. 160.

13. "Concrete day-to-day functions of the international control organ, in relation to which no 'veto' will be applied, should be defined in an appropriate convention." Statement by Andrei Gromyko to United Press, Aug. 1947, as reprinted in Bulletin, Vol. 3, No. 10, p. 302.

14. Reprinted in UNAEC, Second Report (Sept. 1947), Pt. IV.

15. A degree of specificity has, to be sure, been approached in the UNAEC's Second Report in the proposals in Part II, Chapter 6, dealing with the rights of, and limitations on, the control agency in relation to inspection, surveys, and explorations. This chapter introduces the concept of "an international court or body" to issue warrants to inspectors in appropriate cases, but the court's composition and jurisdiction are left undeveloped. Moreover, all questions of prohibitions and enforcement are expressly set aside for later study.

16. That the United States' position may be less adamant than has been supposed is suggested by Senator Austin's speech of October 18, 1948, before the Political Committee of the General Assembly in which he said: "In an atmosphere of cooperation on the basic elements of control, the matter of the veto could probably be worked out quite easily." *N. Y. Times*, Oct. 19, 1948, p. 8.

(Continued on Page 362)

THE NEXT PHASE OF THE INTERNATIONAL CONTROL DISCUSSIONS

Edward A. Shils

While aware of the explosive possibilities in the resumption of the UNAEC discussions, Mr. Shils shares Dr. Cavers' conviction that elaboration of specific issues must be substituted for wrangling over principles. A sociologist, Mr. Shils divides his time between the London School of Economics and the University of Chicago. He is a member of the BULLETIN's editorial board.

The United Nations Atomic Energy Commission has been called back to work and its six sponsoring powers have been ordered to consult among themselves to discover whether a basis of agreement exists upon which an effective scheme of international control could be established. Neither of these decisions are among those which could be regarded as most useful for the restoration of a peaceful atmosphere in the world. The Atomic Energy Commission foundered in the distrust and hostility arising from the many points of conflict between the Soviet Union and the West which had existed long before the atomic bomb war developed. Its very foundering aggravated the international situation and in turn made for an even more intense antagonism.

Now that the Soviet Union and the United States have become hostile to the point where neither considerations of reason nor of long-run security prevail in their respective policies, the issues have become so overladen with spitefulness, acrimony and the advanced stages of a nervous shuttle of abuse and counter-abuse, and of a counter-threat, that men have come more and more to lose sight of the real issues and the real dangers.

The Chances of Success and the Penalty of Failure

The reopening of one of the main trouble-creating sources—the UN Atomic Energy discussions—can scarcely lead to an improvement in the situation. A re-enunciation of the failure of the Commission to come to an agreement can only cause a further deterioration and it must be recognized that the chances for disagreement in the present situation are vastly greater than the chances for agreement. The anti-Sovietism, which in varying degrees of intensity has become so widespread in Britain and the United States, will certainly receive fresh strength from another failure of the Commission.

But as if this were not enough, the Political Committee and the General Assembly have both recommended that the six sponsoring powers should consult among themselves. If this means a conference among the heads of states, the failure is nearly certain and the consequence probably very unfortunate. The Berlin discussions showed how poor are the chances at present for successful face-to-face negotiations on the highest level. In the Berlin situation, neither side was directly involved in an immediately vital strategic position—the Berlin problem is only a problem in face-saving and in indirect pressure covered by a technical subterfuge, and either side could have yielded entirely to the other without direct and immediate disadvantage from the point of view of military security.

The atomic energy problem is far more complicated; it involves tremendous calculations often running directly and deeply into the unknown concerning the strategic implications of various control measures. The contest of anxiety about the *direct* military significance of the atomic bomb is certainly more intense than that which surrounds the small and circumscribable Berlin issue. The hopes which would be raised by such a conference among those who are not already irretrievably committed to one partisanship or the other and who are not entirely certain of the inevitability of another war would be very great and their frustration by such a conference would only contribute to a hardening of that attitude in the West which makes a third world war appear to be inevitable.

Another evidence of this failure to agree—this time it would be very spectacular—would also damage the state of mind of Western Europe; it would deepen the apathetic resignation of a large part of the population and it would also strengthen the two poles of anti-Soviet and anti-American fanaticism, each of which needs the probability of the atomic bomb war to sustain its mania.

The prospects then of the establishment of an effective system of international control as a result of the resolution of the General Assembly are negligible and the consequences of failure are likely to be very pernicious. Yet we are committed to their execution and it will not do merely to go through the motions or to sabotage them.

The Stages Problem Is One Useful Subject of Study

Despite the near-hopelessness of the situation, there is still very much work on which the AEC can properly engage—although much of it might turn out to be nothing but intellectual exercise. At the end of the Second Report a number of specific problems were ennumerated which had not been treated by the Commission during its deliberations. These include the question of stages, the administration of an international control organization, the elaboration of the quota system, etc. There are good reasons for the Commission to direct its attention to these discussions at present, not merely as a way of keeping busy on interesting subjects, but in order to guarantee that justice is done, that all possibilities and implications are explored, and that every effort is made to meet the requirements of national interests (particularly Soviet national interest) compatible with an effective scheme of control which would offer a high degree of assurance of security.

The stages problem has long been a stumbling block and it is one in which a combination of good will and imagination could perhaps do something—indeed certainly could have done something—to remove. The

needs of internal politics in the U.S.A., and the necessity to reassure Congress and the public that the Administration, and especially the State Department, would not give up the great strategic advantage of the atomic bomb except in return for strong guarantees, such as the Lilienthal-Baruch proposals would have provided, caused many people in the United States and in Britain to fail to appreciate sufficiently the fact that not enough concern had been given to Soviet interests in this particular respect.

The world-wide survey which was called for as a first stage would have been a major breach in the "iron curtain" of Soviet secrecy for which the Soviet Union would not have received anything immediate in compensation. It was not reasonable for us to demand of the Soviet Union that it submit to this sudden widening of the differential in strategic positions between herself and the West unless some more determinate period could have been specified, at the end of which no atomic bombs would have existed in the hands of any national power or international organization (i.e. the end-state originally envisaged by the Lilienthal-Baruch proposal).

Some widening of the differential in favor of the United States is inevitable in the first stage of any useful control scheme except one which requires the simultaneous and complete destruction of the entire American atomic bomb stock pile and the plants for the production of nuclear fuel—something which not even the Russians in their wildest moments demanded. Recognizing this, it is necessary, if we wish to do our duty, to work out a scheme which would come to culmination before the Soviet Union itself could reasonably be expected to produce a large bomb stockpile.

In any case, as long as the Soviet Union does not possess atomic bombs it is at a disadvantage *vis a vis* the United States. It must be our aim to see that on the basis of the best available evidence and estimates the period in which the Soviet Union would be kept without atomic bombs while America still possessed them would not be longer than the period in which they would be without them as a result simply of the limitations of their own scientific and engineering resources.

A greater concentration of attention on stages has been repeatedly called for in the pages of this Bulletin at a time when success in devising a satisfactory scheme of stages would perhaps by an outside chance have contributed to the improvement of the situation. Nothing was done, either by groups of scientists in the United States or Britain or by the UNAEC. Meanwhile, as the American atomic bomb stockpile grows and as long as no other state has acquired atomic bombs, the differential advantage of the U. S. increases and thereby renders a satisfactory solution of the stages problem more difficult.

Still the problem must now be faced. We should be sure that every concession compatible with security from atomic bombs is made to the Soviet Union, that every one of their legitimate objections is met and that their spurious arguments are clearly exposed in their spuriousness.

In the discussion of the stages problem, the recent proposal of the simultaneous conclusion of the two Conventions made by the Soviet delegates in Paris should be carefully and respectfully treated, its implications patiently examined and expounded so that the issue becomes clear not only to the members of the UNAEC but to the public of Britain, America, and Western Europe. Only then—when the ambiguity of the term "simultaneity" has been exposed—will it be possible for weary, worried men of good will to resist the seduction of the alluring "concession" with which the Russians have attempted to bedazzle a confused and depressed public—and in which they seem partially to have succeeded.

Quota Problem Offers Some Hope of Agreement

Simultaneously with the examination of the stages question another sub-committee of the AEC should devote itself to the quota problem. It is not possible to say with certainty just how serious the Soviets are in their expression of interest in the quota proposals. It is entirely conceivable that they see in it one more possibility of prolonging the life of the AEC until the moment at which they believe that they have successfully evaded the responsibility for having obstructed its work and brought it to nothing.

The arguments of Professor Blackett in his recent book, written from a strong pro-Soviet standpoint, would tend to confirm this hypothesis, but we must not allow it to stand in the way of our making every attempt to work out a quota scheme which will protect the world from atomic bombs and protect a power-poor country like the Soviet Union from feeling cheated of something which it might otherwise have if its activities were not subjected to control.

At present, neither of the main blocs is committed to any particular quota proposal. They are both on record as favoring it and this would appear to offer one of the few slightly hopeful signs of progress to agreement. Where one side is already committed in advance to discussion of a definitely worked out scheme, the chances of concessions are small, but where neither has anything but a generally favorable predisposition, an acceptable solution might perhaps be found jointly through discussion.

This discussion might eventually end only as a technical exercise, obstructed and irritated by the usual Soviet noncommittal obstinacy and uncooperativeness even in the answering of elementary factual questions. We must do this in order to demonstrate our good will to the world and to show the feasibility of the proposals which hitherto were set forth only in the most general form. Here, too, every effort must be made to show that unfair and unrewarding demands are not being made on the Soviet Union.

Specific Plan of Operation Might Allay Soviet Fears

Thirdly, the UNAEC should devote itself to the study of the organization and administration of the international control body. It should estimate how many persons would be required over each of the number of years immediately ensuing from the present; what types of skill would be necessary; from what countries they could be recruited; how their reliability could be ascertained and guaranteed, etc. This will be necessary to refute the Soviet (and Blackett) canard that the system of control will be part of an American hegemony and also because the elaboration of the stages scheme will restore conclusions about the rates of recruitment, training, etc., of qualified personnel.

The same sub-committee which is to be concerned with the character of the international control body should also be charged with the task of elaborating in some detail the mode of

adjudicating disagreements within the international control body. It should be done in such a way as to make clear and practicable a division of decisions between those which are to be settled in the control treaty (or convention) which will have to have unanimous acceptance before coming into effect, and those decisions which can be made by the majority vote within the international control body. Again, it is not likely that the deeplying suspiciousness of the Soviet élite can be erradicated simply by rational measures, but in the Commission itself we must take all steps necessary to meet every rational fear which the Russians might have of being outvoted by a consistently unsympathetic majority.

Russians Should Also Elaborate Their Proposal

Here, too, by the clarification of issues great progress can be made in the dissolution of some of the irrationality which prevents agreement. This point by point consideration of the kinds of issues likely to arise and the ways of resolving them will circumscribe the veto question in such a manner as to render it more amenable to rational matter of fact discussion, and it might prepare the way for a more conciliatory attitude on the veto question among the members of the majority.

Perhaps as important as any of the suggestions made in the preceding paragraph is another urgent obligation of the renascent UNAEC: one sub-committee must, at the very beginning of the new sessions, give all its attention to a painstaking attempt to elicit from the Russians an exposition of the probable operation of the scheme they presented in June 1947 with the same degree of detail which characterises the majority proposal in the Second Report. It is of course quite possible, if the Russians follow their usual tactics, that practically no information will be forthcoming from them. As we have seen in so many cases in the UNAEC the Russians have lived from hand to mouth, policies being thrown forward which were not thought out and which did not rest on a basis of carefully elaborated previous studies.

If that is the case with respect to the Soviet inspection proposals, then the members of the majority, and particularly the Americans who have the most technical knowledge in these matters, must attempt to take the role of the Russians as sympathetically as possible, to try to imagine how such a scheme would work in its day to day operations. Then, either with or without Soviet co-operation, but after careful and patient study, it would be possible to know and to explain to the world more clearly than has hitherto been done by the opponents of the Soviet scheme whether and wherein the Soviet scheme is inadequate. It is necessary that the Soviet scheme should not be prejudged in the UNAEC, however strong the presumptive evidence against it.

In these discussions the American and British delegates must show the same imagination and persistence they showed in their earlier technical discussions. The Soviet capacity to irritate and produce a sense of frustration and pointlessness must be neutralized. It will certainly be difficult to achieve this level of detachment while maintaining sufficient interest and devotion in a task which seems to be destined to end in failure. But it is only by doing so that we will be certain that we have done all in our power to meet every reasonable Soviet objection to our plan and that we have made every attempt to examine their own proposals. If we succeed in doing this, then we shall also have less to fear from irresponsible Soviet propaganda which emanates from Soviet, British, American and French sources, and which simply by vehement reiteration, impresses the gullible.

But it is not at the level of these technical discussions that the really sharp thorns will be encountered. These will enter most seriously into the consultations of the six sponsoring powers—i.e., the five permanent members of the Security Council and Canada. It is important in the first place that this consultation should not be allowed to become, under thoughtless and well-intended pressure from British and American groups and clever but ultimately self-defeating propaganda from Soviet sources, a meeting of the heads of state of the six powers.

There was perhaps a time about one and a half years ago when such a measure might conceivably have been fruitful. That is no longer so. The Soviet proposal for a one-third disarmament was far too clearly a propaganda device to afford any encouragement as to the possibility of negotiating by diplomatic means a genuine disarmament agreement. And yet the problem of international control of the atomic bomb can scarcely be discussed without also discussing disarmament in conventional weapons and in the newer means of mass destruction other than atomic bombs.

The situation has become too tangled and too filled with distrust and active hostility for a general disarmament program to have any chance of acceptance—and it certainly could not be satisfactorily settled by a meeting of the heads of state in a fairly short conference. The time for large imaginative solutions, for Utopian politics, is over for the time being. The larger and the more generous the measure, the more suspect it will be in this situation in which each principal expects nothing but harm from his adversary. There are, moreover, so many outstanding and fearsome issues that the settlement of any one involves a decision as to almost all the others. Where there are too many decisions to be made more or less simultaneously—as they would have to be in an "overall settlement," the sham and the anxiety would be too great for any one of them to be made.

Compromise Must Take Place on Practical Level

It is therefore necessary for the "consultations" to be carried on at a level lower than the heads of state or foreign secretaries—in order not to raise popular hopes too high and not to cast them down too far—and they should be confined as much as possible to the atomic energy problems which have already been recognized as such. Within these terms of reference, the majority and particularly the Americans should prepare to make some concessions to the Soviet Union.

It is especially on the question of the veto on sanctions that a concession can easily be made. It might not solve our problem but it would perhaps reduce the intensity of Soviet intemperateness and thus create a more lucid atmosphere within which an agreement would have a slightly greater chance of realization.

For reasons which have been repeatedly set forth in the Bulletin, the United States would lose practically nothing from the security standpoint by the withdrawal of the proposal to abolish the veto on sanctions in atomic energy matters. From the propaganda standpoint, which must unfortunately be considered by us much more than it has hitherto, the United

States would stand to gain considerably.

It must be recognized that except for some rather substantial but still very technical and therefore unspectacular concessions in the Working Papers, we have not made a single concession to the Soviet Union. We have certainly not made any spectacular "concessions" such as the Soviet Union has made by agreeing to international inspection in 1947 after having furiously opposed it and by offering the "concession" of the simultaneous conclusion of the prohibition and control conventions. It should be noted that the first Soviet concession was really only a concession as compared with their earlier refusal (Autumn 1946) to allow any type of international control and was thus only a virtue by contrast with a very large-scale vice, and although the second concession is a hollow and technically meaningless or at least extremely ambiguous propaganda action.

Still to the as yet uncommitted peace-seeking and bewildered men of Western Europe, Britain and America and to the delegates of the small nations in the UN, they do look like real concessions. They are accordingly a challenge to the United States and Britain to produce a counter-concession. In our case, however, these concessions must be genuinely intended because they are right and not simply a struggle for public support; the latter will be a desirable but incidental by-product.

To do this well, we must above all free ourselves from the infection of self-righteousness and irritation which has increasingly characterised the behaviour of our senior delegates to the UNAEC. Vishinsky, when he charges the majority representation with having been too irritated to consider the Soviet proposals with sufficient seriousness fails of course to cite the fact that it was the highly exasperating behaviour of his agents and subordinates in the UNAEC which brought this about.

There can be no doubt that the tactics of the Soviet delegates from Gromyko down would have tried the patience of saints, but in view of the issues at stake, our delegates must attempt to be more than saints in this regard. There is little that we can do directly to improve the mode of Soviet behaviour in international bodies—the best that we can hope to do is to create an atmosphere in which rational discussions can be carried on and in which the potentialities of the Soviet delegates for rational discussion can be nurtured.

Unfortunately it does not seem as if the long exposure of some of our British and American senior delegates to the Soviet tactics has left them with sufficient patience and internal intellectual freedom to meet these requirements. Instead of refuting fallacious Soviet arguments in the form in which they are delivered, there has been an increasing tendency to deal with them in an intellectually casual and yet rigid fashion. Increasingly our delegates have shown rigidity and dogmatism, failing to re-expound the good grounds of their own position but instead flailing the Soviets with phrases and arguments which have become clichés in their own minds. There has also been a pronounced tendency towards moralizing and self-righteousness, and the continued exhibition of these qualities will reduce whatever small chance there is to influence the Soviets in the right direction or, what is more important and hopeful at present, to influence world opinion in the right direction. There seems then to be a need to change the composition of our representation to the consultation of the sponsoring powers.

Even if we make every concession in substance and every modification in procedure compatible with the realization of an effective scheme of international control along Lilienthal lines, we are still unlikely to succeed. When we fail we must be sure that our failure does not precipitate a further deterioration of the situation. We must be sure that it does not raise the level of anxiety in Europe and in America.

To prevent the failure from having too deleterious consequences, we must do everything in our power to avoid becoming overexcited ourselves. Our press and our politicians must exert a more judicious self-control; the justification of good policies in terms of their anticommunist consequences must be diminished and in this the State Department, and especially the President and the Senate Foreign Affairs Committee in America, and the Foreign Secretary and his deputies and representatives in Great Britain have especially great responsibilities. The main and immediate aim of our policy at present must be the rehabilitation and stabilization of Western Europe. If we succeed in that, if western Germany becomes an effective contributor to the welfare of Western Europe, if France and Italy cease to be objects of our worries and the Cominform's efforts, then the Soviets might accept the stabilization of the situation as something to which they must adjust themselves, and nerves everywhere might settle down. When that is done, then we can once more restore our attention to the primary task of the formation of the moral consensus among the nations. Meanwhile the situation will have become all the more dangerous as far as the atomic bomb situation itself is now concerned: the American bomb stockpile will have increased; the destructive power of the bomb will likewise have increased. The means of delivery will have become more effective over greater distances, and the Soviets will have progressed towards producing their own atomic bombs. The urgency of the establishment of consensus will be greater than ever, and we need the steadiest possible nerves and the clearest possible brains if we are to keep our eye persistently on the right object and prevent it from receding further and further into the distance.

New Life for UNAEC

(Continued from Page 358)

Now, to be sure, in the first case, if the offender chose the veto and war resulted, the war would be predicated on Article 51 of the Charter conferring on nations the right to self-defense,[17] whereas, in the second case, the war could be based on the articles of the Charter providing for the exercise of force by the Security Council and obligating member-nations to participate in such action. This, however, is a legal distinction that would not be likely to alter materially the list of the fighting powers. It is a distinction worth an argument in conference but scarcely worth the sacrifice of ultimate agreement.

Operating on borrowed time, the UN Atomic Energy Commission may still bring to fruition the hopes with which it was created; but, for it to do this, it must defer the hope of agreement in principle until, for each of the three major problems in the application of controls, it can determine, in concrete terms, just what such agreement would entail.

17. Article 51 applies only in the event of an "armed attack". However, as early as July 12, 1946, the United States urged that, in the atomic energy control convention treaty, "armed attack" be defined to include "certain steps in themselves preliminary to" the actual dropping of an atomic bomb. See U. S. Memorandum No. 3, July 12, 1946, *supra* note 12. Even if no agreement is reached on this point, one may be reasonably sure what the *de facto* interpretation would be.

THE ATOMIC DEADLOCK COULD BE BROKEN

E. M. Friedwald

With the kind permission of the editors of DISCOVERY we reprint the following symposium which first appeared in the August, September and October issues of that magazine. For lack of space we have condensed Mr. Friedwald's excellent introductory summary and analysis of negotiations for international control. Mr. Friedwald is the author of "Man's Last Chance—A Survey of Political Creeds and Scientific Realities." Professor Mott, of Bristol University, was formerly president of the British Atomic Scientist's Association. Dr. Oliphant, of Birmingham University, was technical advisor to the Australian Government's delegation at Lake Success. Dr. Urey is a member of the Institute for Nuclear Studies at the University of Chicago.

The starting point in the international control of atomic energy is the Report of the State Department published in March, 1946.

The recommendations of this Report form the core of the proposals for a world control scheme (the Baruch Proposals) put forward by the United States to the Atomic Energy Commission of the United Nations. They can be briefly summarized as follows:

1. Establishment of an international authority to be in sole control of all operations classed as dangerous, and to have power to deal with new developments as they arise.

2. The Authority to license, control and inspect all other atomic energy activities left under national control.

3. The power of veto not to apply either to the day-to-day work of the Authority or to the punishment of transgressors.

4. The control scheme to be put into effect in successive stages, the United States gradually relinquishing, to the extent required by each stage, national control of its atomic activities.

Russian objections to the Baruch plan have been many and varied, but have finally crystallized into three main points: the power of veto in relation to the punishment of transgressors, the step-by-step procedure for the setting up of the control scheme, and opposition to international ownership of deposits or plants, or to supra-national management of them, to unlimited access to atomic plants for inspection, to aerial surveys by the Authority, in short, to anything which would make the control effective and real.

An Atomic Development Authority without Russia

It is clear that as long as the Soviet Union maintains its uncompromising stand on the principle of absolute national sovereignty there is no possibility of establishing any really effective scheme for control of atomic energy which would embrace the whole world. And this being so, the rest of the world seems to have resigned itself to drifting, to letting things take their course and hoping for the best. Not that there is any hope of the United States retaining its monopoly for more than a few years.

At the beginning of 1948, President Truman's Air Policy Commission gave it as their opinion that on January 1, 1953, America would face A-Day—the day when foreign countries would almost certainly possess atomic weapons and effective long-range guided missiles in quantity. Once this stage has been reached, the establishment of an effective control scheme will, for technical as well as political reasons, be infinitely more difficult than it is now. And the hope that some vague and ill-defined fear of reprisals would be enough to prevent any aggressor from using atomic weapons goes against the accumulated experience of history. No amount of wishful thinking can alter the fact that to drift is, in all probability, to drift towards global disaster.

What then is the alternative?

Surely if, in the absence of Russian co-operation, it is impossible to establish a control system which would prevent the manufacture of atomic weapons, the next best thing would be to devise a system which would effectively prevent their use; and this can be done without Russian co-operation. In other words, the five-sixths of the world which recognizes the imperative need for a certain measure of world integration should go ahead without Russia. Naturally a control scheme excluding the 300 million people of the Russian bloc could not aim at preventing atomic armaments: on the contrary, it must aim at producing the most advanced and effective atomic weapons, at distributing them according to strategic necessities, at holding itself ready for instant action—in short, at building up such an overwhelming power as to confront any potential aggressor with the certainty of swift annihilation. If the Authority maintains plants and stocks of atomic weapons in western Europe, the Middle East, India, China, Alaska, in a word, everywhere within its jurisdiction, if it is ready to act at a moment's notice, no aggressor could hope to escape total destruction. And wars do not start unless an aggressor has reason to believe that he has something to gain without risking too much.

Naturally, if such a scheme is to succeed, the Authority would have to be something very different from the United Nations. It would have to be a truly supra-national authority, able to make its own decisions without any reference to purely national interests, and endowed with the authority—and the power—to enforce them. Herein undoubtedly lies the biggest single obstacle to the realization of such a scheme, for even the nations in favour of an effective atomic control would not lightly agree to merge an appreciable part of their sovereignty into a supra-national body. But they have explicitly recognized the need to take this fateful step, and there is no rea-

son why they should change their minds. Once this major obstacle has been overcome, the others present no great difficulty.

Are There Obstacles to a Scheme without Russia?

Indeed, what are the other objections to an atomic control scheme without Russia?

It is often argued in the United States that the sharing of atomic knowledge with nationals of other countries participating in the scheme would make it easier for Russia to learn whatever there remains to be learned of the secrets of the atom. But this contention ignores the fact that the real secret is not something which can be easily passed over on a slip of paper. It lies rather in the accumulated experience and vast working knowledge of a large body of scientists and technologists thoroughly conversant with all the tricks of scientific technique, all of which is the natural appurtenance of a nation accounting for nearly three-quarters of the world's industry. To gain any real advantages from 'atom spying', Russia would have to get hold of a large number of foreign scientists and technologists—and the right ones at that. Moreover, the primary aim of the scheme would be to prevent the use, not the manufacture, of atomic weapons.

Another and more serious objection is that a country in which the Authority has built plants and stocks might turn communist and seize them. The answer to such a contingency is that the Authority's sites would have extraterritorial rights, and that any attempt by any country to seize them would amount to aggression and as such be liable to full retribution. The danger of seizure might be minimized by some device whereby plant and stocks could in an emergency be destroyed at a moment's notice.

These are objections of a technical nature. But there is also another argument, a political one. It is said that as any atomic alliance excluding Russia must, by the logic of facts, be potentially of an anti-Russian character, an atomic control scheme excluding the Soviet Union would permanently split East from West and destroy what slender chance remains of a rapprochement.

Even if this were true, it would still be an infinitely better solution than the one which consists in drifting and doing nothing. For this way lies atomic chaos—on the dawn of A-Day, and the likelihood of a fully fledged atomic war to follow sooner or later.

But is it so certain that starting without Russia would permanently split East from West?

So far the Soviet Union has determinedly opposed any control scheme which would stand a reasonable chance of fulfilling its functions effectively. And there is every reason to believe that it will continue to maintain its opposition as long as it is led to believe that by its mere abstention it can frustrate any initiative on the part of the West in establishing some form of atomic order. But if the West decided to go ahead without Russia, if it succeeded, as it certainly would, in binding together the greater part of the world in the control of the atom, it would create an atomic alliance so overwhelmingly powerful that its mere existence would constitute a permanent threat to any nation standing outside it. How long could Russia, which has so clearly shown her fear of any kind of bloc, afford to stand aside from such an overwhelmingly powerful combination? The political realism which runs like a thread throughout Russian history encourages the view that it would not be very long. In fact, to start without Russia may be the only peaceful way of getting her co-operation.

An Atomic Alliance Holds No Security for Britain

N. F. Mott

Mr. Friedwald's article calls for a world-wide alliance, which, acting through a supra-national authority, would deter the Russian Government from any aggressive act by the threat of overwhelming attack with atomic weapons. Mr. Friedwald calls his authority an A.D.A. without Russia, but this in my view is a most misleading designation. The purpose of the A.D.A., as envisaged originally in the Lilienthal report, was to develop atomic energy for peaceful purposes all over the world, under a scheme of international ownership and control which would ensure that the facilities built up were not diverted to the production of weapons. Mr. Friedwald, on the other hand, proposes that the countries outside the Russian orbit should produce atomic bombs to the limit of their capacity; and he is certainly wrong in thinking that an authority set up for this purpose would erect plant or accumulate bombs in Europe or in the Middle East. Military considerations would ensure, as in the last war, that manufacturing plant should be built in the relative safety of North America, whence if need arose bombs could be rapidly transported by air to the forward bases. Apart from the provision of these bases and of armies to guard them, the only specifically 'atomic' contribution which Europe could make to the alliance would be the services of her scientists, who, as in the last war, could co-operate with their American colleagues in the production of these weapons. Even if plants were erected in Europe, the number of bombs which could be produced there would be insignificant compared with that in the United States.

A loose military alliance between Western Europe and the United States seems now to be taking shape, and apart from the implication, with which I disagree, that such an alliance would be strengthened by the sharing of atomic development, Mr. Friedwald's article recommends little beyond the building up of the alliance and an open decision to use atomic weapons in case of war. His article, however, does not discuss the real problems involved in this policy. These seem to me to be as follows. In Western Europe the governments, supported by much of the population, wish to be free from the fear that the communist parties in their countries can, in the last resort and at an appropriate time, count on armed Russian support. In this they have the sympathy of the United States, and, with American support, in course of time it may be possible to build up in Europe land forces which can hold Western Europe against the Red Army. This, however, cannot be done quickly, and an alternative policy which appeals to influential circles in the United States as quicker, cheaper in manpower and more effective, is to rely on the threat of destruction of Russian cities by a large strategic air force. This policy relies on the technical superiority of the United States

in aviation and especially in the large-scale production of atomic weapons, which is likely to persist for many years after Russia begins to make them. It has to be admitted, however, that no attack by atomic weapons which we can envisage at present would alone prevent the Red Army from advancing to the Pyrenees, putting the industry of Europe to work for them and attacking Great Britain from Calais with long-range weapons. If defence through a strategic air force is to be the policy of the West, it is on its threat that Europe must rely; if the threat fails, Europe, and probably Great Britain too, are faced with such devastation that the hope of eventual American liberation offers little compensation.

Those who demand an alliance based on strategic bombing with atomic weapons have to ask themselves this question: is it likely that an alliance can quickly acquire such power that its threat will never be used, and that a *pax Americana* will give the world that period of peace which it so badly needs? Or is it equally likely that under the mounting threat of atomic bombing the Russian pressure to expand their sphere of influence will be increased to a point where it will precipitate the armed conflict which we hope to avoid?

Western Control Means Eastern Supremacy

M. L. Oliphant

Scientists who took part in the wartime development of atomic energy gave earnest thought to the moral and practical problems which would arise if their efforts were successful. When it became clear that a weapon of unprecedented power would be produced, discussion of these problems was intensified. It was thought that the new weapon had such unique and terrifying properties that its control would provide a test case of the possibility of international agreement, for it should be possible to discuss this material problem in an atmosphere free from the inevitable differences which arise over most other questions which so often involve nationality, economics, creed or language. Dr. Robert Oppenheimer, who led the team which produced the bomb itself, was appointed a member of the committee set up under Lilienthal to make proposals, and he was able to incorporate, in the control scheme formulated, much of the substance of the discussions among his fellow scientists. The official policy of the United States, embodied in the Baruch proposals, was naturally more rigid politically than the Lilienthal recommendations, but retained the generosity and grandeur of the original scheme.

The high hopes of the scientists were shattered in the earliest days of the deliberations of the Atomic Energy Commission. Before the end of the first month of operation of this clumsy body, where there was no discussion, no spontaneity, but only political speech, the scientific advisers present knew that they had failed.

It was right to make the experiment. If the case could have been argued dispassionately around the table, some agreed scheme might have emerged. It was equally right to abandon discussion when deadlock on vital principles rendered continuation abortive. Atomic energy has become just one more factor emphasising the political cleavage between West and East. In retrospect, it is clear that if an atmosphere had been provided in which agreement on the U.S. proposals were possible, the need for such a system of control would have disappeared. Atomic energy is now where it belonged from the beginning as part of the problem of peace and war, of the relationship between the peoples of the world.

The essence of the system of control advocated by the United States and agreed by the Western Powers, at any rate in principle, is that it must be world-wide. Adoption of the Baruch proposals by nations other than Russia and her satellites could give no security whatever. Indeed, inflexibility of the organization needed would inevitably retard development of atomic energy in the western world, for peaceful as for warlike purposes. It would do little good to lose supremacy in this field to the more easily integrated eastern powers. It is doubtful, too, whether, when the time came to translate these idealistic concepts of a control scheme into action, countries such as Belgium, which enjoy a virtual monopoly of uranium supplies, would be any more ready to see them spread thinly and fairly over the globe than are those countries which possess oil! In fact, the question of the workability of a scheme of such close collaboration depends upon the feasibility of internationalization on a scale which would render war and nationalism alike unthinkable.

I am convinced that control of atomic energy can be achieved only by so great a degree of political unification of the world that control is virtually a domestic problem. We must work for this unity—not for nice clean wars without weapons of mass destruction, but for the elimination of war itself. I believe that the basic principles of the loose association which has evolved in the British Commonwealth of Nations provide the key for this wider union.

Atomic Energy Control Is Impossible without World Government

H. C. Urey

There is no easy road to the solution of a large problem. It is necessary to go back to fundamentals, and succeed or fail by facing them no matter how stubborn or how difficult that may appear to be.

The proposals for an Atomic Development Authority would not have worked had they been adopted as proposed by Mr. Baruch. It was always my hope while I was one of Mr. Baruch's advisers that someone would see the limited character of these proposals and make the initial suggestion that they must be greatly extended in scope if they were to grow into a workable scheme at all. No one did so, and it was obvious two months after the beginning of deliberations on June 14, 1946, that there would be no success along these lines.

It is impossible to control anything through the medium of any organization unless that organization has the sovereign right to control. Because nothing remains static in human affairs, the organization must have an

adequate mechanism of a dynamic character to take care of the control of any problem. These two conditions add up inevitably to the establishment of a world government if atomic energy is to be controlled. It must possess the sovereign right to control, from which there would be no appeal to higher authority. Experience has shown that governments must have a mechanism for the enactment of law, methods for its enforcement, and courts to adjudicate disputes. They must have a means of supporting themselves by taxation. The Atomic Development Authority as proposed by Mr. Baruch would have had a rather hazily defined and limited sovereignty inadequate to the problem at hand, but would have had no adequate mechanism for the other posers described.

People say that it is impossible to secure world government at the present time, which I think is probably correct, but I wish to say that neither can we get control of atomic energy without it, and both of these statements add up to a very unhappy conclusion.

Humanity has faced unhappy conclusions before, but perhaps not one quite so dismal as this. If we do nothing but drift, a global war is in prospect, with, I believe, Europe seriously damaged or destroyed. If we make any aggressive moves along the line that Mr. Friedwald suggests, we are likely to have a global war, with—again—Europe seriously damaged or destroyed. No matter what we do there is a strong probability of very bad results.

Under these circumstances, I think it will be necessary courageously, even desperately, to do what we think is the correct and progressive thing in the situation, and hope that Providence smiles upon us. I believe that we should strive for a world government in all countries of the world by any effective means. I believe that at the present time Russia will not join in such plans, but I may be wrong. Whether she will or not, the western countries should proceed nevertheless. Some people will say that this is an alliance against Russia. It will be such an alliance for some, and perhaps it is even necessary that there be such an alliance. But the important thing is to remember that it is necessary to begin organizing the many separate sovereignties of the world into one, and without that solution no progress is made anyhow. All of us, however, should keep in mind the fact that our problem—namely, the avoidance of a modern war by any methods whatever—cannot be accomplished in the end without including all countries in a world government. If all of us can keep that objective firmly in mind, and recognize that no war promotes the good will and understanding that is necessary to a successful government, perhaps it may lead us to try to avoid wars of all kinds while we move toward this objective.

Reply to the Three Professors

E. M. Friedwald

There is no gainsaying the fact that the idea of an atomic alliance excluding Russia does not appeal to the majority of scientists. At least such seems to be the conclusions to be drawn from the enunciations of groups of scientists and from the comments of individual scientists which have appeared in *Discovery's* columns in the last two months. This reluctance is only natural. For the attitude of the scientist is inevitably a rational one, whereas politics is anything but rational, particularly in the sphere of international relations.

Professor Urey is characteristically the scientist when he says that to solve a large problem it is necessary to go back to fundamentals. This is exactly how the scientist approaches a problem in his own field. But he is tempted to overlook the essential difference between scientific and political problems. In science it is the fundamentals that are most difficult to ascertain, but once they have been established the rest is a matter of patience and routine. In politics it is easy enough to ascertain the fundamentals; the main difficulty arises when these fundamentals have to be translated into terms of practical application.

Any man of goodwill can see that the only rational answer to the threat of atom bombs and weapons of global destruction is world government. But to those who have a sense of what is and what is not politically feasible it is equally apparent that world government cannot be had for the asking, that it cannot be brought into existence overnight or even in a few years, that to ask righteously for too much from political man is to court the risk of getting nothing at all.

Professor Urey contends that the Baruch proposals, even had they been adopted in full, would not have made a workable scheme. If this contention is taken to mean that the proposed Atomic Development Authority could not have prevented an atomic war if a Power or a group of Powers had been bent on it, it is certainly valid. But to belittle the Baruch proposals on these grounds is to ignore the immense political benefits which the scheme would have conferred on the world. For by providing a warning signal, it would have given all nations a reasonable assurance against a sudden and overwhelming atomic blow. If the Baruch plan had succeeded in doing no more than dispelling this tension, it would by that alone have made an outstanding contribution to the preservation of peace. But the great political wisdom of the Baruch plan lay in that, while it coped with the short-term problem of preventing an atomic armament race, it at the same time provided a nucleus around which world government could gradually be built—not overnight as idealists would have it, but in the course of decades and perhaps generations as exacerbated nationalism would allow it.

Professor Urey seems, however, to recognize, implicitly if not explicitly, the necessity for an atomic alliance without Russia. For though he apparently condemns such an alliance on the ground that it might lead to war, he advocates at the same time what might be called a "five-sixths-world government", i.e. a world government excluding the Russian bloc. But it is clear that such a government would have to fulfil the primary function of any government, namely, to insure its territories against outside aggression. And as the only possible answer to scientific warfare is retaliation, it would still have to produce the maximum amount of the most advanced scientific weapons and distribute them strategically so as to discourage any outsider from resorting to aggression. In other words, this "five-sixths-world government" would not be very different basically from the proposed atomic alliance—except that it might be infinitely more difficult of realization.

The same "fundamentalist" approach characterizes Professor Oliphant's attitude. To him the only

solution lies in the elimination of war itself by so great a degree of internationalization and political unification as would virtually amount to world government. But in view of Russia's inflexible opposition—quite apart from the obvious reluctance of other nations to submerge themselves at one plunge into a fully-fledged world government—this line of argument does not lead very far.

As for the contention that an atomic authority excluding Russia would acquire such inflexibility of organization as to retard development of atomic energy in the West and thereby bring about the loss of atomic supremacy to the East, it is, to say the least, completely unsupported either by argument or by fact. On the contrary, there is the precedent of the American organization which very efficiently produced the atomic bomb and which continues to develop atomic energy no less efficiently. Naturally, an atomic authority could be so conceived as to have all the stultifying effects of red tape—if, for instance, it were to be merely an international authority subject to all the limitations and frustrations of international assemblies. But it could also be made into a deadly efficient body—if it were to be a truly supranational authority invested with all the attributes necessary for fulfilling its purpose. In fact, if the only argument against an atomic control scheme without Russia were the danger of inefficiency, there would be little cause for alarm—particularly in view of the deadening effects of the Soviet system on Russian science.

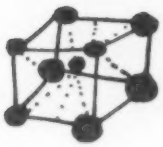
Russian Aims Would Be Clarified

But there is another, and apparently much more weighty, argument: Professor Mott expresses it by asking whether it is not likely that an atomic alliance of the West would provoke Russia into occupying the whole of the Continent as far as the Channel and the Pyrenees, and attacking Britain from Calais with long-range weapons.

If Russia were really prepared to go to war rather than see the establishment of some sort of atomic order and the consequent recovery of Western Europe, it would be clear beyond doubt what her ultimate objects are. It would also be obvious that such a war could not have been avoided but only postponed. But if this were the case, it would be far more advantageous to the West that this war should take place while the West still holds the monopoly, or at least a clear superiority, over the East in the atomic field. In fact, Professor Mott's argument, far from detracting from the merits of an atomic alliance without Russia, makes out the strongest possible case for it.

All in all, the scientific approach to the political problem of the atom has as yet hardly proved helpful. All that the Atomic Scientists' Association found it worth while to say on the subject was to state the rather obvious fact that a scheme without Russia would not be the same thing as one with Russia, and that, above all, it would do nothing to eliminate secrecy in scientific and technical matters—as though on this secrecy hung the fate of the world. The A.S.A.'s formula for the solution of the atomic problem is the promotion of measures designed to make war less likely and the reaching of a settlement between East and West! But then hardly anyone—except perhaps some scientists—needed to be told that.

THE SCIENTIST AND THE COMMUNITY



Jacques Maritain

This contribution from the famous French philosopher and former envoy to the Vatican continues the series of comments on an article "Freedom Demands Responsibility" by Cuthbert Daniel and Arthur M. Squires printed in the October issue of the BULLETIN, Vol. 4, No. 10.

The problems raised by the essay belong to a category of moral problems that the present stage of civilization makes especially serious, and which deal with the relationship between the conscience of the individual and the technical structure of the community.

I think that, as a result of the impact of the applications of science on the destiny of mankind, the scientist can no longer be entirely satisfied with his purely scientific work. He is reminded that he is both a scientist and a man, with responsibilities as a man.

He will probably be brought to acknowledge that science provides us only with *means*—the use of which, for good or evil, depends on the moral rectitude of our will and on our appreciation of the ends of human life. Thus the very development of science will lay a new obligation upon the scientist: he will have to become aware of the fact that science is not enough and that wisdom, which deals with the *ends* is necessary; and he will have to acquire sufficient competence to stand committed to metaphysical, religious and moral issues.

A similar obligation will probably be acknowledged with respect to political matters. Since the use of the most momentous new discoveries in physics is in the hands of the State, the scientist is requested by the very development of science to assume his own responsibilities, as a man and as a citizen, in the political field.

The scientist would be ill-advised, in my opinion, to pretend to supersede the political leaders who, being the representatives of the people are the legitimate retainers of public authority in a free society.

No doubt, on the other hand, he has always the possibility of giving up scientific research if he blames the manner in which its results are used. But this would be an escape rather than a solution.

The main thing for the scientist is to endeavor to control by democratic means, that is, through the people, the use that the State makes of scientific discoveries. I think in this connection that the scientists will be led to get together in national and international unions devoted to the very problems that the political use of science makes urgent for them, especially to the problems of world peace. By means of such unions they would be able to exercise a serious influence over the political life of nations, in using their moral authority to act upon governments, enlighten public opinion and awaken powerful currents in the peoples.

SCIENCE AND POLITICS IN RUSSIA

L. C. Dunn

In this issue the BULLETIN presents accounts of the genetics controversy in Russia by two prominent American scientists, L. C. Dunn and H. J. Muller. Dr. Dunn is Professor of Zoology at Columbia University, a member of the National Academy of Science, and the author of numerous books and articles on the subject of genetics and heredity. This account was written for the Overseas News Agency and is used by their kind permission.

The recent flare-up of controversy among Russian scientists over the issue of heredity versus environment has brought about a new head-on clash between science and politics.

The dispute covered ground which had been explored laboriously by experimental scientists over seven decades. It was decided in Moscow by a political dictum of the Central Committee of the Communist Party. The issues involved opposing views on several challenging questions:

Can plants, animals and human beings be deliberately and permanently changed to suit changing conditions and a changing society?

Are the scientific methods and philosophy which have generally served in agricultural and applied research adequate in a Communist society?

Can science yield more benefits for more people when conducted under free enterprise, as in the United States, or under political control as in Russia?

The resignation of Professor H. J. Muller of the University of Indiana of his membership in the USSR's Academy of Science again focused attention on the dispute that has agitated Russian scientists and politicians for 15 years. Dr. Muller, a Nobel Prize winner for his work in genetics, quit the Academy in protest against dismissal by the Soviet Government of certain scientists who had disagreed with the doctrines of agriculturalists led by Professor T. D. Lysenko.[1]

Ostensibly, two related scientific questions were involved — Mendel's theory of heredity, and the inheritance of acquired characteristics. Both usually belong in the sphere of the science of genetics. Actually, however, the controversy lapped over into political issues.

The scientific aspects are clear, and there is enough evidence to permit any objective person to choose between the alternatives. Mendel's explanation of heredity, first published in 1866 and extended later by Professor T. H. Morgan of Columbia University and others, held that plants and animals inherit collections of living units, like molecules, known as genes. Thousands of these condition the reactions between individual and environment. Each gene, governing specific qualities of structure and function of the body, is considered stable and is passed on unchanged from parent to offspring. The rules guiding the transmission and expression of genes have been formulated exactly enough to permit prediction of the results of certain matings—a fact widely recognized in the breeding of plants and domestic animals.

Controversy Hinges on Part Played by Genes in Heredity

Of key importance in the present controversy is the explanation of how genes originate—or rather, how an old one changes to produce new effects. Professor Muller and other geneticists state that the changes occur suddenly within the gene, without relation to any similar change in the body of the parent. Just how is not specified, but some hints have come from experiments with exposure of sex cells to large doses of X-rays and other forms of radiation.

It is known that attempts to change heredity by changing the bodies or reactions of the parents have generally failed or led to indecisive results. The change is clearly localized in the genes.

The long history of experimentation is usually summarized in the statement that characteristics acquired by parents are not inherited by the offspring. These two sides—of Mendelian heredity by genes and the non-inheritance of acquired characteristics—obviously hang together.

It is precisely these two foundation stones of the modern view of heredity that the Soviet agronomist Lysenko and his adherents insist are all wrong. Lysenko's view, which he acquired directly from his teacher Michurin, the Russian counterpart of Luther Burbank, is that valuable crop plants can be improved by improving their environment, and that the improvements are transmitted to the offspring. His school has published results of experiments which they say show that plants, such as wheat, which have been made to mature earlier by exposing their seeds to cold, transmit this acquired character to their offspring and that wheat strains peculiarly fitted to the Russian north have in fact been produced this way.

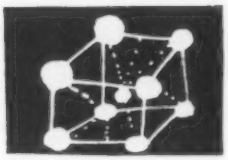
Since this can be done, Lysenko maintains, it becomes a waste of time to go through the long process of seed selection and variety testing which the followers of Mendel and Morgan insist is the correct method. And Lysenko goes further: if the classical method is wrong, then those who pursue it are guilty not only of ignorance but of sabotage of the Soviet state.

It is not surprising that in Russia, where the aim is a quick change to the socialist Utopia, the inheritance of acquired characteristics has been a prime scientific problem claiming a priority interest of politicians. Three major public debates were held under official Moscow auspices—one in 1936, one in 1939, and the last in August, 1948, when some 30 scientists participated. In the first two meetings, the geneticists (called the "Mendelists-Morganists" by the Lysenko group) fought the Lysenko-ites to a draw; no official decision was handed down. But after this year's debate, which was reported verbatim through 16 issues of *Pravda*, an official editorial of August 12 stated: "The session of the Lenin-All-Union Academy of Agricultural Sciences concluded its work a few days ago. Academician

(Continued on Page 383)

1. Sir Henry Dale, former president of the British Association for the Advancement of Science, has also announced his resignation.

THE CRUSHING OF GENETICS IN THE USSR



H. J. Muller

Professor Muller's article on the scientific essence, histor and implications of the genetics controversy in the USSR published in the SATURDAY REVIEW OF LITERATU cember 4 and 11. With the permission of the editor, in a form slightly altered by the author, the section deaing with the history of the conflict. Dr. Muller is well qualified to discuss this situation by his close acquaintance with the persons involved and by his participation in the events. Dr. Muller was Senior Geneticist at the Institute of Genetics of the Academy of Sciences in the Soviet Union from September 1933 to March, 1937.

The willful destruction of science in the U.S.S.R. by politicians is a tragedy of the greatest significance. Until the recently announced decision of the Central Executive Committee of the Communist Party of the Soviet Union, which made official and public their repudiation of the entire science of genetics, and their setting up in its stead of the ancient superstitions of teleologically directed germinal change and of the inheritance of acquired characters, there seemed to some outsiders room for doubt as to the genuinesness of the assault on human knowledge by the Soviet governing body. But now he who runs may read.

We must confess that we no longer see any chance of saving the core of biological science, and all that goes with it, in that section of the world in our generation, short of an unexpected political overturn. Nor could it be completely restored in just one more generation. Our present task can only be that of autopsy, in the hope of finding ways of checking the already dangerous spread of the present infection to countries outside the Soviet hemisphere, and of making clear to the people of those countries the important lessons for culture and for civilization in general which are involved.

Controversy Has No Scientific Basis

Let it be understood that we are not dealing here with a real controversy between scientists, or with a decision as to the relative merits of two extant scientific theories. We are dealing with a frontal attack upon science itself. For there has long been no doubt in the minds of responsible students of the subject anywhere in the world that the principles of genetics represent the joint verdict of countless careful observations and that they are soundly grounded on the theoretical side. As in the progress of any other science, there have of course been some missteps during the development of genetics, but these have been thrashed out among the scientists themselves and corrected, and, on the whole, a remarkable concordance has been attained in regard to the basic concepts. There are, to be sure, many important questions which are still unsettled, lying on the frontiers of research, but it is not these which are really involved in the present attack but rather that whole area of the science which is well behind our advancing front of investigation and has for years been firmly established.

It is quite evident that the Soviet politicians, being uneducated in modern natural science, and having proved themselves unwilling or unable to grasp the exacting technicalities involved in genetic reasoning, have through motives of their own taken a dislike to its conclusions, and have accordingly maneuvered to have it cast into the limbo. This aim they have accomplished by the use of the same combination of flagrant misrepresentation and calculated brutality which has marked their dealings with their political opponents. Yet, ironically enough, the great majority of the geneticists who have been purged were thoroughly loyal politically, and many were even ardent crusaders for the Soviet system and leadership, as the writer well knows through long personal contact with them.

What has happened to genetics and related fields during the past few months in the U.S.S.R. is only the dramatic culmination of a long drawn out campaign which for more than twelve years has been ruthlessly waged against this section of science and the workers engaged in it. Genetics in the U.S.S.R. had reached a very high state of advancement, and many eminent scientists were engaged in it. No actual scientists could be found to take up the contest against it. Hence resort was had in 1935 and the years that followed to the making of a special "build-up" for an ignorant but demagogic and fanatical peasant, Lysenko, who had turned plant breeder. True, Lysenko had the advantage of having achieved some doubtful success in applying (by trial and error procedures) an early American discovery concerning the influencing of the time of maturation of certain crops by pre-treatments of seeds. But this gives him no more claim to being a geneticist than does doctoring dogs for worms, and it does not, by itself, constitute Lysenko a scientist at all. His writings along theoretical lines are, to a scientist, the merest drivel, and he obviously fails to comprehend either what a controlled experiment is or those known principles of genetics that are taught in any elementary course in the subject.

The role of second in command was taken by a suave, satanic and unscrupulous juggler of words, the dialectical materialist "philosospher" Present. His authoritarian sophistries have been calculated to lend an aura of profundity and orthodoxy that confuses and impresses the earnest lay disciple of the Party Line. However, equally with Lysenko's imprecations, his argumentation is thoroughly unscientific in its method, and fails to stand up either under theoretical analysis or by the test of objective results.

These two careerists, pulling the wires of the Party machine below as

well as being liberally hoisted from above, have been represented to the public as *bona fide* scientists. They have been thrust forward, over the heads of the conscientious experimentalists, to raise the flag of a naive and self-contradictory party dogma, parading as a contending scientific theory. This dogma, although taking the name of Darwinism, actually harks back to pre-Darwinian days that had been all but forgotten by modern scientists.

That Lysenko and Present are not, as they are made to appear, self-constituted leaders of the rebellion against science, but are themselves merely the tools of the highest political power, is shown by a number of telling facts. For one thing, not a few geneticists of high standing were separately martyrized on assorted pretexts in the period prior to 1937, i.e. before Lysenko and Present had risen to such high estate as to render their own allegations a sufficient excuse for the meting out of such treatment. Only a deep-seated antagonism to genetics on the part of the higher authorities can explain why, in 1933 or thereabouts, the geneticists Chetverikoff, Ferry, and Ephroimson had all on separate occasions, been banished to Siberia and Levitsky to a labor camp in the European Arctic, or why, in 1936, the Communist geneticist Agol was quietly imprisoned and done away with in the Ukraine, after rumors that he had been convicted of "Menshevik Idealism" in genetics.

The Cutting Off of International Contacts

Again, it may be asked why, in 1936, the Medicogenetical Institute, founded and directed by the loyal Party member Solomon Levit, which with its numerous staff of biologists, psychologists and over 200 physicians constituted a shining example, unmatched anywhere in the world, of the possibilities of research in human genetics, was scurrilously vilified and misrepresented in *Pravda*, and then dissolved. The accusations alleged that the Institute had been attempting to exalt heredity as against environment, whereas everyone conversant with it knows that it had been entirely objective in its gathering of data but that, in its interpretations, it had been leaning as far as possible, if not even too far, in the environmentalist direction. Levit himself made, under pressure, a "confession" of scientific guilt, which he admitted to the writer was entirely false and given only out of loyalty to the Party which demanded it. Immediately afterwards he was abstracted from the scene, and has not been heard from since.

Both Agol and Levit spent a year working on Rockefeller Foundation Fellowships under the writer's direction in Texas in 1931-32. They were able then to express themselves freely in private conversation without fear of reprisals. Yet the writer can vouch that both of them went out of their way on every occasion to defend the Soviet regime, the policies and person of Stalin, and the orthodox philosophy of dialectical materialism, and that they made rather a nuisance of themselves in magnifying the importance of environmental influences even where the pertinent evidence was weak or absent. In short they were convinced Stalinists but, being scientists with dangerous knowledge and data, they had to be sacrificed, without waiting for the Punch and Judy show in which Lysenko and Present were to appear as the favorite puppets.

Other convincing evidence of the power behind the scenes is to be seen in the meteoric rise of Lysenko, Present and their hangers-on, once the stage had been set for them in 1936. In December of that year there was a carefully pre-arranged and widely publicized "genetics controversy," held before a packed auditorium of invited spectators and in this Lysenko appeared as the main speaker for what may be called the prosecution. It was obvious that the Party administrators, sitting as chairman, paid no attention to the painstaking scientific arguments of the geneticist defendants, and did not use that opportunity to gain knowledge of the subject, but that they brightened up at every crude slander dropped by the attacking clique. And despite the enthusiastic siding of the entire scientifically educated portion of the audience with the geneticists, the final verdict of the administrators and of the organs of publicity while not yet daring to damn them completely, took the geneticists heavily to task and let them out with warnings. The book of published addresses of this congress, although already heavily expurgated when printed, was within a few months on the banned list.

In the autumn of 1936, the Seventh International Congress of Genetics, which was to have been held in Moscow in the summer of 1937, was called off without explanation, and even without notification of the scientists in other countries until word of it had been smuggled out many months later, although it was then untruly claimed to have been merely "postponed." This step was taken only after the Party had first toyed with the idea of allowing it to be held with the omission of all papers on evolution and on human genetics, in spite of the fact that many foreign geneticists had intended in such papers to attack the Nazi racist doctrines! In 1939, when Edinburgh, in substitution for Moscow, acted as host to this Congress, all forty Soviet geneticists who had sent papers to it were at the last moment forbidden to come. At the same time the world renowned and widely beloved Congress president, Nicolai Ivanovitch Vavilov, who was the Soviet's leading *bona fide* geneticist, sent to Edinburgh a discourteous letter of resignation which, according to information in my possession, had been written for him. During that same year, another public "genetics controversy" was staged in Moscow, and this time the now greatly exalted Lysenkoists, entirely un-injured in the administrative mind by the complete scientific refutation which they had been subjected to in 1936, were made to appear as the clear-cut victors, while Vavilov and the geneticists in general, appearing as culprits, were put to shame. At about that time, Vavilov's important posts as president of the Lenin Academy of Agricultural Sciences, head of the Institute of Plant Production, and head of the Institute of Genetics were turned over to Lysenko, who was also given various high honors and decorations.

Process of Establishing Orthodoxy Is Continued

In 1941, during the time of the Soviet-Nazi liason, Vavilov was arrested and put in prison, and it has later been learned that he was sentenced to death on the trumped up charge of being a British spy. This was, however, commuted when, after the attack by the Nazis, the U.S.S.R. allied herself with Britain. Soon afterwards an eye witness observed Vavilov in a concentration camp at Saratov in a state of physical collapse, although he had originally been a man capable of enduring the utmost rigors. He was thereupon sent to far northwesten Siberia,, near the Sea of Okhotsk, where he died in 1942. Thus ended a man of the greatest vigor, buoyancy and charm, one who

was devoid of jealousy and widely loved, and who, although not a Party member, had for years been one of the 400 members of the Central Executive Committee of the Soviet Government. This fabulously productive man had undoubtedly done more for the genetic development of Soviet agriculture than has ever been done by anyone else for any country in the world. It is said that after his death his matchless collection of thousands of varieties of economically important agricultural plants, with its invaluable reservoir of genes, painstakingly gathered by him and his coworkers on expeditions sent all over the world, was largely allowed to lapse, as were many of the specially constructed "pure lines" of crop plants.

During the same years, and since that time, the attack on other geneticists, and on the science of genetics in general, continued. But, owing to the imposed internal secrecy, the censorship on news leaving the country, and the existence of war conditions, it is not possible to know the real causes of death of such distinguished scientists in this field as Karpechenko, Koltzoff, Serebrovsky and Levitsky. Certain it is, however, that, from 1936 onwards, geneticists of all ranks throughout the country were terrorized. Most of those who were not imprisoned, banished or executed were forced into other lines of work. And perusal of the published papers shows that, in the mildest cases, those in which they were allowed to remain in their own laboratories, the great majority were driven to redirect their researches in such a way as to give the appearance of trying to prove the correctneess of the anti-scientific views. During the disorganization attending the windup of the war, some escaped to the west. A few, however, were retained through it all, as show pieces who proved that the U.S.S.R. did still have its working geneticists.

In September, 1947, these remaining geneticists, and those biologists in related fields who still had the temerity to support the genetic viewpoint, were led into a trap. The columns of the Moscow Literary Gazette were opened to them to express their views. Three of them made use of this apparent return to freedom of scientific discussion by restating the case for genetics. Lysenko and Present thereupon replied in their characteristic style. This paved the way for a new Soviet "conference" on genetics, in July, 1948, with a considerable number of participants. This presumably was the Russian substitute for the Eighth International Congress of Genetics in Stockholm which, according to a priceless official statement sent to that Congress by the Academy of Sciences of the U.S.S.R., the Russian geneticists were "too busy to attend." Once more the real and the spurious scientists argued. Finally, Lysenko make his historic announcement that the Communist Central Committee had in fact prejudged the case, and had already decided in his own favor. This decision by a non-scientific political body of course decided the argument.

Party members among the geneticist participants in the conference at once made public recantations of their heresies, pretending to change their convictions overnight. The presidium of the Academy of Sciences, headed by the obedient physicist Sergei Ivanovitch Vavilov, brother of the great geneticist who had been done to death, toed the line by removing from their posts with dishonor the greatest Soviet physiologist, Orbeli, the greatest Soviet student of morphogenesis, Schmalhausen, and the best remaining Soviet geneticist, Dubinin. The entire laboratory of the latter, long known for the admirable work which had been carried out there by numerous careful investigators, was closed down. It is not to be expected that we will hear of these men again, nor of the scores of less renowned scientists who were working with them or in other institutions along similar lines.

It is noteworthy that Orbeli and Schmalhausen were biologists in other fields than genetics, who, however, recognized the fundamental and indispensible place occupied by genetic principles in the biological sciences in general. With most of the geneticists themselves gone, those in kindred subjects had now become more open to attack. The operation has already gone further, as more recent accounts in *Pravda* state that, at the last meeting of the Academy of Medical Sciences, September ninth and tenth, a whole group of leaders in physiology, microbiology, epidemiology, psychiatry, etc. were severely attacked for "supporting Mendelian views."

Although it has been a long time since genetics as such has been allowed to be taught in the U.S.S.R., the Academy of Agricultural Sciences has called for the rewriting of biological textbooks and the revision of courses in biology and related subjects so as to remove all traces of genetic doctrines. The minister of higher education, Kaftanov, on September ninth confessed that his own ministry had been too lax in the past and promised the eradication of all university teachers and research workers infected with the reactionary "theory" (the quotations are his) of "Mendelism-Morganism." He cited a considerable number of distinguished names as being in the list of the proscribed and gave the names of "Michurinists" who were replacing them. He also announced that the "cleansing" of the entire curriculum as well as of the personnel of the publishing houses and journals was proceeding.

These matters are now widely publicized in the Soviet press, and popular feeling against the scientists is deliberately being aroused. At the same time, the Academies are making public obeisances to Stalin himself, thanking him for his direction and his "daily assistance to scientists", and pledging themselves to correct their errors. And Malenkov, Deputy Premier of the Soviet Union, and, since Zhdanov's death, widely considered the most likely successor to Stalin, is now mentioned specifically in press dispatches as having Lysenko among his most important proteges.

Attack Is Extended to Atomic Physics

The attack on "bourgeois" influence in Soviet science was extended to the field of atomic physics on November 24 in an article by Vladimir Lvov, appearing in the Russian "Literary Gazette." Mr. Lvov accused four Soviet physicists of following the "reactionary idealism and formalism" of the Copenhagen school of nuclear physics while trying to disguise their work in dialectical and Marxist robes. The four physicists are: Yacov I. Frankel, author of "Wave Mechanics," E. Shpolsky, M. Markov, and V. Svidersky, who recently published an article entitled "Two Trends in Modern Atomic Physics in Space and Time."

A POLITICAL SCIENTIST TAKES ISSUE WITH EDITORIAL STATEMENT

The writer of the following letter, Sir Alfred Zimmern, is Emeritus Professor of International Relations in the University of Oxford and Visiting Professor in Trinity College, Hartford, Conn.

Sir:

As a British political scientist now residing in the United States and a recent subscriber to your journal, I am surprised to read in the Editorial of your November issue that you regard the question of the abolition of the veto in the Security Council for decisions concerning the violation of atomic controls as an "irrelevancy". Mr. Baruch, in his famous speech on June 19, 1946, said that if the veto remained, his Plan would involve a "deception" to which he was unwilling to lend himself. Are you really prepared to reduce the Plan on which mankind is placing such hopes to another "piece of paper"?

I realize the considerations, referred to in the course of your Editorial, which have influenced your opinion in this matter. But will you allow me to question whether on the political side of the issue which concerns us both, you are displaying an intellectual courage matching that which you and your colleagues have shown so conspicuously on the more strictly scientific side?

Admittedly, the Baruch Plan which leads up to a vetoless Security Council, leaves the working of the world authority in an unsatisfactory condition. But surely the right course is to go forward from this point, not to turn back to the now discredited diplomatic system of which the Security Council is an expression. For the political scientist, the Baruch Plan is not a final solution, but a challenge to devise political machinery adequate to carry responsibility for the proposed World Authority. As he sees it, what is needed is an executive body on the world level capable of taking prompt decisions in emergencies when, in Mr. Baruch's words, "to delay may be to die". The Security Council is by its nature and composition quite unfitted to bear such a responsibility.

Executive bodies are composed of individuals who pool their thinking and arrive at a common decision. The Security Council is composed not of individuals but of States. The individuals actually sitting at the table cannot arrive at a common mind, for they are diplomats deliberating, as best they can, on the basis of instructions from distant governments. The Security Council is in fact not a Council at all but a Conference. It is a standing diplomatic Conference whose true nature is concealed by its grandiose title. It is a relic of the old European power-political system imbedded in the structure of an organisation devised on different lines and in a different spirit.

In another article in the same issue of the *Bulletin* Professor Urey renews his plea for "world government". It is not necessary to go that length in order to meet the political challenge presented by the Baruch Report. All that is necessary is A WORLD EXECUTIVE. And that is not only necessary but urgent, if we are not to drift within the next few years into a competition between finished atomic armaments—and between still more dreadful weapons.

How can such an EXECUTIVE be formed? The answer is not difficult, if statesmen and their advisers would only summon their intellectual courage.

The Chief Executive of the United States and the Vice President are elected, according to the United States Constitution, by an Electoral College. This device, useful in the early days of the Republic, is no longer needed owing to the integration which has taken place since 1789. But the same system, slightly modified, could very well be applied on the world-level. Let Congress and other Representative Bodies of the United Nations nominate the members of an Electoral College and let that College choose an EXECUTIVE, consisting, say, of seven persons, to replace the present Security Council. The apportionment of the members of the Electoral College might be based on the percentage contributions of Member States to the United Nations budget. This would, as matters now stand, give Congress the right to nominate 40 members out of a total Electoral College membership of about 125 (assuming that nations contributing less than 1% would each nominate one member), the members of this new Executive would hold office for five years, exercising the powers of the present Security Council as defined in Chapter V of the UN Charter. Thus they would not be a World Executive in the full sense. They would deal only with matters involving a threat or danger to world peace.

But my object in writing is not to set forth a particular political plan, but to urge that you and your scientific collaborators should face up to the political problem instead of invoking prudential reasons for evading it. That problem is not, as you seem inclined to think, an issue between U.S.A. and the U.S.S.R. or between any two States, or groups of States. It is the issue between those who see the future of the world in terms of community and those whose minds cling to modes of thinking and organisation which the discovery of atomic energy has rendered obsolete.

Let those who hold the forward view act together and frame a practical program which can be carried out in the short four years which remain to us before the full force of atomic competition is let loose upon the world.

What is clearly needed is parallel action upon two United Nations fronts. The Baruch Plan should be taken up again and set going between the nations, comprising the great majority of UN Members, who are willing to take part in it. And at the same time the procedure laid down in Article 109 of the Charter should be set in motion for the summoning of a General Conference to review the working of the Charter and to fill the gap caused by its failure to provide for an effective executive.

Yours faithfully,
Alfred Zimmern

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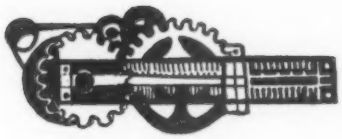
SCIENCE AND SECURITY



Karl T. Compton

Dr. Compton made the following speech at the 75th anniversary celebration of Ohio State University on October 15. Dr. Compton has recently resigned as President of Massachusetts Institute of Technology and now succeeds Dr. Vannevar Bush as Chairman of the Research and Development Board of the National Military Establishment.

We have now a far greater public awareness than ever before of the value of pure and applied science to our economy. Many facts demonstrate this. One is found in the budgets for scientific research in our universities. I have no up-to-date over-all figures on this item but I know that our higher educational institutions were spending about $30,000,000 per year on research just before the war, and I believe the figure is now double that, though a large part of it is now coming through government contracts and industrial grants.

On the industrial research side are the following figures which are found in a recent bulletin from Stanford Research Institute. In 1915 there were 100 industrial research laboratories, employing 3,000 people; in 1920 there were 300 laboratories, employing 9,300 people; in 1946 there were 2,500 laboratories, employing 133,500 people. The annual research and development expenditures by industry, as listed in the Steelman Report, *Science and Public Policy*, increased from $116,000,000 in 1930 to $234,000,000 in 1940, and are expected to reach $500,000,000 in 1950.

Governmental expenditures for research and development were $67,000,000 in 1940, and will probably be about $500,000,000 in 1950, according to the Steelman Report. Furthermore, in the last two successive years Congress has almost passed legislation to establish a National Science Foundation, in recognition of the importance to our country of a considerably accelerated program of scientific research, going beyond the capacity or present willingness of private organizations or individuals to carry the desirable full financial responsibility.

It is significant that in public discussions in the press, in Congress, or by national leaders, while there may be disagreement on most other national policies, there seems to be no disagreement with the thesis that the strength and welfare of our country require an active program of research to discover new knowledge and of development to apply this knowledge to meet human needs.

Allotments for Scientific Research in Government and Industry

One of the most heartening factors recently has been the new look which many important industries are giving to their own opportunities and responsibilities for support of scientific education and research. Some companies have adopted extensive programs of scholarships and fellowships; others have been contributing generously to meet the new scientific and engineering needs of our educational institutions. Many large industrial organizations have appointed committees of their operating officers to review the question of the company's role in these matters and to make appropriate recommendations for more liberal policies. All are simultaneously enlarging their own internal research activities.

In listing these various lines of favorable evidence I should also emphasize the actions which have been taken by many state legislatures to provide new capital facilities and increased operating funds to enable their state universities to play their appropriate role in this increasingly scientific era.

All this is far from saying that the needs and opportunities in science have been completely met. For example, the institution which I serve estimates that $20,000,000 of new capital facilities of buildings, laboratories and equipment, plus $10,000,000 of additional endowment or its equivalent, represent our present really urgent needs for things which are clearly necessary to keep up with the field of technological developments and to carry on the scientific projects which are now clearly defined. $10,000,000 of this has recently been raised; $20,000,000 is still needed. I know that a similar situation, on a larger or a smaller scale, now confronts all of our institutions of higher education.

On the military side the story is very similar. More funds and more activity are found in research and development than ever before in peace-time. For over-all coordination, study and direction there has been established a Research and Development Board, operating directly under the Secretary of Defense. In the post-war effort to cut down expenses of the military establishment, scientific research and development was treated with especial generosity. I have heard it claimed, though I cannot vouch for the literal accuracy of the statement that the Congress has never cut a requested appropriation for research for the Armed Services. Such cuts as have been made in the estimates of needs have been made by the Executive Department and not by Congress. This is certainly true in general, although there may be exceptions, and I think it is significant as an indication of popular recognition of the role of science in our security.

Also new in this whole picture is the tremendous atomic energy program, financed almost completely by public funds, operated principally by industrial companies or educational institutions under the over-all planning and supervision of the Atomic Energy Commission. The stakes here are tremendous, for either peace or war. Undoubtedly the potential development of atomic energy is still in its infancy. Someone has described our present status of atomic power as about equivalent to that of steam power when James Watt first noticed that the steam lifted the lid on his mother's tea kettle.

Diminishing Natural Resources Are a Challenge to Science

But over and beyond the considerations of security which involve concentration on problems of the near future — problems like full employment for security of jobs, business prosperity for security of standards of living, and military preparedness

in these troubled times for security against international aggression—there is another aspect of security which is beginning to loom on the horizon. It is a long term problem which affects the entire human race and which is causing great anxiety among the relatively few who have given expert thought to the problem but is beginning to come into public consciousness. I refer to the problem created by rapidly increasing populations on the one hand, and the steady exhaustion of those natural resources of soil, minerals and fresh water on which the human race depends for its existence. Books like Fairfield Osborn's *Our Plundered Planet* are beginning to come out to portray the stark inevitability of a catastrophe which may not be many generations off unless some very strenuous measures are taken to prevent it. We already know, for example, that approximately one-third of the soil fertility of our United States has been lost by erosion or by failure to replenish in the soil those essential elements which are extracted from it by repeated crops. We know that this is the process which was basically responsible for the decline and fall of ancient empires in Egypt and the Middle East. We know that it is presently a desperate problem in the highly populated and long inhabited regions of Asia. We know that there is very little leeway in the future for meeting this problem by the discovery and exploitation of presently primitive areas. I have been told, just to take one example, that the supply of lead which is believed to be economically available will be exhausted within about ten years at the present rate of consumption. There has been extraordinary success in the discovery of new oil fields but we all know that this cannot continue forever. Even the present populations and the demands of our modern civilization for fresh water are exhausting the supply more rapidly than it is replenished over very large areas of our own country.

This is probably the most important fundamental problem which is facing the human race. It is partly a sociological problem but it is equally importantly a scientific problem because, basic to any social or political actions, must be first scientific analysis of the problem and the technological development of substitutes for depleted materials, and the discovery of methods for using those materials which we still have far more intelligently and efficiently than they are being used at present. One person has expressed this problem by saying that "it is no longer a question of natural resources but of intelligent resourcefulness."

Therefore, while we are immersed in a consideration of our present economic, political and international problems, and concerned with our security on all of these fronts, there looms in the background with an importance which becomes greater with the passage of every year, this greatest of security problems and challenges to science, namely, the ultimate safety of the human race and the threat of its decline, even down to the stage of a bare struggle for existence on this planet.

Limiting Factors in Scientific Development

What I have said about the significance of science to our economy and to our military security is well known, and I have mentioned these points only for background and for emphasis on their importance. Let me speak now of the other side of the picture. What are some of the things, other than lack of funds adequate for the work in sight, which are standing in the way of our ability quickly to reap the potential benefits from science?

The first of these limiting factors is the shortage of qualified scientists to carry on effectively the research programs which can now be clearly outlined, and of adequately competent development engineers to carry forward the desirable practical applications based on this scientific progress. The field of nuclear science and atomic energy is the most outstanding example of this shortage. There are exciting new developments in the field of medicine and nutrition which present clear opportunities far beyond the ability of the men presently trained in these fields to exploit promptly. Many other examples might be cited. This is a limitation of which our educational institutions are acutely aware, because we encounter it in our attempts to recruit adequate teaching staffs, and we also encounter it in the demands which are made upon us by industrial and governmental organizations to recommend graduates competently prepared to undertake the various tasks in the governmental and industrial development programs.

Much is being done to meet this emergency. The fact that our educational institutions are crowded to capacity is one bit of evidence. The way in which various governmental agencies, like the Atomic Energy Commission and the Office of Naval Research, and also various forward-looking industries, are making funds available to our educational institutions for research, permits these institutions to employ promising young men and thereby not only to carry on the desired research, but in the same process to develop a more numerous group of highly qualified scientific workers. This is one of the most encouraging aspects of the present situation.

In spite of these favorable factors, however, we are not meeting the demand as effectively as we might. Many of our educational institutions are limited seriously in what they can do by the lack of major facilities which are necessary to tackle effectively the problems in some of the newly developing technological fields. On the human side, as distinct from physical facilities, many surveys have indicated that we are failing to give adequate educational opportunity to a very sizable portion of our population which is qualified to take advantage of these opportunities.

This point has been strongly emphasized, for example, by my friend, President Conant of Harvard University, in his appeal for education in a "classless society." He calls attention to the substantial portion of our secondary school graduates who have the undoubted ability to profit by a higher education but who are prevented from doing so either for financial reasons or because of a narrow perspective of opportunity, and he points out that all such cases represent definite failures to utilize effectively our potential human resources.

If we go back of higher education and consider the problem of our public schools, we realize how imperfect is our effort to educate our youth along the lines of the very great concept of public education. When a town dog-catcher or comfort station attendant commands a salary higher than that of a public school teacher, and when a very substantial portion of our public school teachers have to be engaged on an emergency substandard basis because of lack of applicants with full qualifications, we

realize that the utilization of personnel in the interests of our over-all economy and security leaves much to be desired. The development of scientists and technologists is only one part of this more general educational problem but it is an important part and at the present time it is one of the "bottlenecks."

I have called attention to some of the limiting factors which stand in the way of the most effective possible utilization of science for the insurance of our security. Funds, facilities and personnel are all intimately related aspects of this limitation, and I think it is clear that the removal of these limitations depends in the last analysis on public understanding of the matter and a sufficiently alert interest in these problems to bring about those actions which will permit their better solution. These actions involve primarily two things: more adequate and more permanently assured financial support on the one hand, and a public concern which will give increased opportunity, prestige and attractiveness to the educational, scientific and engineering professions on the other hand.

Scientific Secrecy and Military Security

Now, in conclusion, I should like to discuss the subject of science and security from quite another angle—an angle based on an understanding of what security means when used in the narrow military sense.

At all times, and especially in time of war, it is necessary to maintain a high degree of secrecy in certain matters, which, if known to the enemy, would give him an advantage and put us at a disadvantage. This secrecy applies, of course, to all types of military planning and preparations. Because of the enormously increased importance of modern scientific developments as applied to warfare, this secrecy has also been very important in connection with the design and contemplated use and even the very existence of new weapons. The atomic bomb is the outstanding recent example, but there are many others, such as the possibilities of bacteriological warfare, new types of airplanes, new methods of detection and destruction of enemy planes or submarines, various types of countermeasures against possible enemy actions, etc. I think no one can properly question the justification and high importance of maintaining adequate secrecy on these points. This fact has been so well recognized that in common parlance and in the public mind the word "security" has often come to be used synonymously with "secrecy." What I wish now to discuss is the relationship between security and secrecy, with especial reference to scientific developments which may be of military significance.

A Balanced Policy Is Indicated

There are two aspects of security, just as there are the two aspects of warfare which we call offensive and defensive. While defensive measures and precautions have to be taken, it is a generally recognized principle that "the best defense is a strong offense." The same principle applies in the matter of security.

Our security in technological matters having to do with warfare rests fundamentally on our being as far as possible ahead of our unfriendly competitor. To be in this favorable position we should prevent our competitor from learning our secrets, which is the defensive aspect, and we should work actively to make significant advances in our own technology, which is the offensive aspect. Neither of these should be neglected. It is evident that if we proceeded actively with our technological developments, but at the same time published them broadcast everywhere, we would permit our competitor to keep pace with us at relatively little expense to himself. At the other extreme, if we should simply sit tight and hold on to our secrets, it would not be long before our competitor had forged ahead of us. Somewhere between these two extremes is the best procedure—and by best I mean the procedure which will give us the most advantageous relative position.

Unfortunately in this case secrecy and progress are mutually inimical, as is true of all progress in science whether for military purposes or otherwise. Science flourishes and progresses in an atmosphere of free inquiry and free interchange of ideas and the continual mutual stimulation of active minds working in the same and related fields. Any element of secrecy which is imposed on this activity acts like a brake to progress. It is for this reason that the most advantageous path between these extremes is difficult to define, and because of this difficulty I believe there is much misunderstanding and confusion in public thinking on the subject. It is much easier for the average citizen to understand secrecy than it is for him to understand the conditions necessary to scientific progress.

It is probably for this reason, among others, that there is such a furore at the present time about possible leaks of secrets, and all who are closely concerned with our scientific progress in military affairs are aware of the fact that the results of this publicity and of some procedures of official investigating groups have had seriously detrimental effects on our progress toward security through scientific research and development. It would be better to take the carefully calculated risk of allowing some confidential information to get out of our hands, if such a policy would enable us to advance our own science and art at a rate which a competitor cannot hope to equal, than to impose by regulation or public opinion a condition which seriously handicaps progress by rendering employment in these pursuits definitely unattractive to top-flight scientists and engineers who have plenty of other opportunities to turn their talents into more comfortable and usually more rewarding directions.

Recent Trend Involves Danger

I am one of the large group of scientists and engineers who are strong advocates of national military preparedness at this time, but who are greatly worried over the detrimental effects, on our work for technological preparedness, of the barrage of publicity regarding alleged espionage and the charges which have been made against reputable scientists on the basis of hearsay and unsubstantial evidence. I confess that when I read what appears in the papers about some of these cases, I generally get the impression that the cases are very serious indeed and that the individuals concerned are very bad actors. This may actually be true in many cases. What bothers me, however, is that in the cases of individuals whom I have known personally and intimately over many years, my knowledge of the character of the men and of the circumstances on

which the charges are based convinces me of the very flimsy character of these charges and the great injustice which is being done to individuals concerned. I am only one of many hundreds, and perhaps thousands of scientists who find themselves in this situation.

What is most needed is to recapture in the public mind, and in the attitudes of the scientists who must do the jobs at hand, that spirit of confidence in and enthusiasm for their work with which we emerged from the war. At that time the public very properly applauded and supported the remarkable technological achievements which played so important a role in our victory. The scientists had great personal satisfaction in having been able to contribute thus substantially to our national effort. If that spirit is maintained we shall make great progress toward the further contributions of science to our national security. If the recent trend of suspicion and lowering morale continues, however, we shall be in really serious danger.

Progress Requires Education

It is desperately important, in this period of international uncertainty, that the present trend be reversed and that the work of scientists and others who are engaged in efforts to promote our national security should again have the public support and commendation which they deservedly received at the end of the war when the public was made aware of their great contributions to our victory. Only then will the people who are so much needed in this work, and who wish to enter it from a patriotic motive, be enabled to do so with enthusiasm and not be forced to view it as something distasteful or dangerous and to be shunned.

This is far from the first time when misguided or uninformed public opinion has stood in the way of progress and security. From the minutes of a Select Committee of the House of Commons in Great Britain in 1879 appears the following quotation from a speech by a member of the London School Board:

"Geography, sir, is ruinous in its effects on the lower classes. Reading, writing and arithmetic are comparatively safe but geography invariably leads to revolution.

"The whole effect, sir, of extra subjects is to diminish the fierce virtues of an ancient people."

We can hope that time, education and better understanding can bring about gradually more intelligent consideration of our various public problems like the ones which I have described tonight. There is some evidence that we can make progress. Compare the present state of public opinion on scientific matters with the following statement which comes from the records of an Ohio school board in the year 1828:

"You are welcome to use the school room to debate all proper questions in, but such things as railroads and telegraphs are impossibilities and rank infidelity. There is nothing in the word of God about them. If God had designed that his intelligent creatures should travel at the frightful speed of fifteen miles an hour by steam, he would have foretold it through his holy prophets. It is a device of Satan to lead immortal souls down to Hell."

Unless we have a catastrophe we can hope that ultimately these difficult questions of public policy, which concern science and many other things, will receive a better understanding and handling than they have at present. But in some of the situations which I have mentioned the time may be short and it is important for this understanding to be exercised very promptly.

In conclusion, I can find no better way of epitomizing the various thoughts which I have expressed in this address than by quoting Pasteur, who said: "In our century science is the soul of the prosperity of nations and the living source of all progress. Undoubtedly the tiring discussions of politics seem to be our guide—empty appearances. What really leads us forward is a few scientific discoveries and their applications."

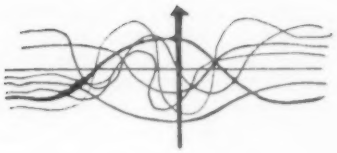
The Committee on Un-American Activities Feels the Effect of November 2

The Congressional Elections of November 2 have led to the elimination of two Republican members of the Committee on Un-American Activities of the House—Vail of Illinois and O'Donnell of Pennsylvania. The chairman of the Committee, Representative Thomas (R. New Jersey) was re-elected, but his indictment on charges of payroll padding makes it unlikely that he will play an active role in the Committee. The anti-Truman attitude of Mr. Rankin, the ranking Democrat on the Committee makes it unlikely that he will be permitted to assume the chairmanship which will then probably pass to the less reactionary Representative Wood (D. Ga.).

These personnel changes, and the general attitude of the voters expressed in the election, make the hope justified that the investigating procedures of the Committee on Un-American Activities will become less objectionable than they have been under Mr. Thomas' chairmanship. We can hope that the still pending "Condon case" will be speedily and satisfactorily disposed of, and that the practice of casting aspersion on scientists and other intellectuals without sufficient public basis in fact and without chance of rebuttal in open hearing will be abandoned.

While it cannot be said that the November 2 vote was cast on the issue of constitutional freedom vs. arbitrary persecution, it is undoubtedly legitimate to infer from the results of this election that the "red spy scare" of the Thomas Committee has not had the effect on the minds of the voters which some Republican leaders hoped for, and many independent observers feared. The forces of obscurantism, which many observers at home and abroad saw as rising inexorably in the wake of the world war and under the impact of the "cold war" with the Soviet Union, has clearly as yet gained but little sway over the American mind.

THE ATOM BOMB AS POLICY MAKER



Bernard Brodie

Dr. Brodie is a member of the Institute of International Studies, Yale University. He is the author of "The Effects of the Atomic Bomb on National Security," a report prepared under the auspices of the War and Navy Departments and reprinted in the BULLETIN, Vol. 3, Nos. 6 and 7. This article is reprinted from the October issue of FOREIGN AFFAIRS with the kind permission of its editor.

It is now three years since an explosion over Hiroshima revealed to the world that man had been given the means of destroying himself. Eight atomic bombs have now been detonated—assuming that the three "atomic weapons" tested at Eniwetok were in fact bombs—and each was in itself a sufficient warning that the promise of eventual benefits resulting from the peacetime use of atomic energy must count as nothing compared to the awful menace of the bomb itself. The good things of earth cannot be enjoyed by dead men, nor can societies which have lost the entire material fabric of their civilization survive as integrated organisms.

Yet the dilemma nevertheless faces us that the enforcement of tolerable behavior among nations will continue for an indefinite time in the future to depend at least occasionally upon coercion or the threat of it, that the instruments of coercion against Great Powers will most likely be found only in the hands of other Great Powers (who can dispense with them only by acknowledging their readiness to forfeit whatever liberties they may happen blessedly to possess), and that those instruments appear fated, largely because of those same imperfections of our society which make power necessary, to include the atomic bomb and perhaps other comparable instruments of mass destruction.

American Security and International Control

Individuals may retreat from this dilemma behind a barrage of high moral protestation, usually combined with glowing predictions of a better world to be. Such retreat is rendered doubly sweet because it is more often than not accompanied by applause, especially from the intellectual wing of our society. But the nation as a whole cannot retreat from the problem, and those who desert simply leave the others to think it through as best they can.

The impact of the atomic bomb on United States policy has thus far been evidenced most clearly in the almost frantic effort to secure the adoption of a system of international control of atomic energy. It is difficult if not impossible to find an historical precedent for the eagerness with which this nation has pursued an endeavor which, if successful, would deprive it of the advantages of monopoly possession of a decisive military weapon. To be sure, the monopoly is bound to be temporary, but that has always been true of new weapons, the monopoly possession of which has usually been jealously guarded for as long as possible. The United States is even now behaving in the customary manner concerning all new weapons other than those based on the explosive release of atomic energy, a fact which in itself sufficiently demonstrates that the exceptional American position on atomic energy control is based on something other than national generosity. That "something other" is of course a well-warranted fear of living in a world which morally and politically is little different from the one we have known but which in addition is characterized by multilateral possession of atomic weapons.

But the fear which engendered the pursuit of international control also provoked the resolve that any control scheme must contain within itself practically watertight guarantees against evasion or violation. That was and remains a wholly reasonable resolve, but its inevitable consequence is that it greatly reduces the chance of securing the requisite agreement. Two years of work by the United Nations Atomic Energy Commission have resulted in some illumination of the problem but almost no progress towards a solution. American initiative in securing formal suspension of the activities of the Commission is a plain acknowledgment of that fact.

But where does that leave us? It leaves us, for one thing, with the unwanted bomb still in our hands, and, so far as we know, still exclusively in our hands. It leaves us also under the compulsion to go on building more bombs, and better ones if possible. We must continue our search for a workable *and secure* international control system by any corridor which reflects even a glimmer of hope of success, but we must also begin to consider somewhat more earnestly and responsibly than we have thus far what it will mean for the nation to adjust to an atomic age devoid of international controls.

Changing Concepts of Security

The ramifications of that adjustment process are legion, but certainly they involve above all a continuing reconsideration of the effects of the bomb upon our plans for the national security. For those to whom "national security" appears too narrow a concept for an atomic age, there are at least three observations that might be made.

In the first place, as the world is now organized, and as it now operates, American security is for all practical purposes synonymous with world security. It is no longer a question whether our political leaders understand that to be the case, though there is much evidence that in the main they do so understand. It is simply that we have reached a stage where large-scale war without American participation borders on the inconceivable. Secondly, national policy, which is perforce concerned primarily with national security, is the only policy upon which we as citizens can hope to exercise any direct influence, and it is our only channel for

affecting international policy. Thirdly, the projects of policy planners are much more likely to prosper if they conform at least occasionally to aspirations which the man on the street fully shares and understands. To him, and to the politician who serves him, the security of the United States is supremely meaningful and important. World security, on the other hand, is an abstraction which gains meaning —at least meaning sufficient to induce him to pay a price for it—only to the extent that he is persuaded that American security is enhanced thereby. The difference may seem superficially a semantic one, but it is more than that. It affects very profoundly the question of the kind and degree of risks one will accept and the character of the price one will pay to achieve security. It certainly affects the basic method by which we proceed to our goal.

Basic Considerations in International Cooperation

Lest we adopt too patronizing an attitude towards the convictions of the layman or the politician, let us consider for a moment the propositions, however dimly he may perceive them, upon which those convictions rest. At least four such propositions may be listed, all of which are basically unaffected by the existence of the atomic bomb.

I. International organization at its existing level of development is obviously inadequate to guarantee either world or American security. This fact explains and partly justifies the preoccupation of most students of international relations with procedures for developing and improving existing bases for international cooperation. But exclusive preoccupation with such ends leaves a large gap which it is inexcusable to ignore, and that for a reason which provides our second proposition.

II. It is clear from any dispassionate and realistic appraisal of the forces at work in international relations today—the kind of appraisal which it is the first responsibility of the specialist in the field to provide—that a highly reliable and effective mechanism for the collective guarantee of security can hardly be deemed to lie within the range of conditions reasonably to be expected within our time. At any rate, the degree of probability is not high. The atomic bomb makes that circumstance more tragic, but it does not otherwise alter it. However much the mechanism described deserves working for, it is certainly a matter of ordinary prudence to take heavy insurance against failure or even against too slow a rate of achievement.

III. Whatever our predictions concerning the future of international cooperation, they must take into account the following basic dilemma: The pursuit of security against war—the objective which takes precedence above all others in the modern world—is not inevitably identical with the pursuit of smoother and more intimate international cooperation, the two being especially divergent where the latter holds out little promise of significant success. Where conciliation fails, one must take steps which may make that failure more certain and more complete. Where the opponent refuses to reason, one can only appease or threaten. There are wide variations in the flexibility and subtlety with which the statesman may either appease or threaten, and the degree of skill which he brings to his task is supremely important. However, it is in the main true that appeasement tends to encourage further unreasonable or "impossible" demands; while the threat or warning, however effective at the moment, tends to wound the opponent and to stimulate in him the desire to be less vulnerable to threat in the future. Nevertheless, the statesman may at any time be faced with a choice between these two alternatives and these alone. He will do well to guarantee for himself in advance the maximum of freedom of choice *between* them.

IV. For the purpose of threat or warning, adequate national strength is indispensable. The statesman who possesses it can choose whether to appease or warn; the one who lacks it can only appease. As General Eisenhower so neatly put it, strength is required to cooperate, weakness can only beg.

Defense Policy in a Bipolar World

In a world in which none of the Great Powers felt threatened by one or more of the others, we could expect to see a salutary neglect of security devices resting on the above propositions. But it is clear from the recent behavior of our Government that it feels itself exposed to a threat from the Soviet Union, and it is almost equally clear that the measures which it is pursuing in response to that feeling of exposure enjoy the broadest popular support. Moreover, some of those measures undeniably entail aggravation of the tensions between the Soviet Union and ourselves. Is it possible to look past the difficulties of the moment to see the basic reasons for that concern?

A senior American naval officer told this writer not so long ago that "American strategic calculations concerning the requirements of *great* wars must envisage the Soviet Union as the opponent, if for no other reason than that she is the only foreign Power whose defeat would require great exertions on our part."

That is a good, simple working rule for an admiral. It recalls the old doctrine of the "natural enemy." It reminds us also that there would still be a problem to concern us even if the Soviet Union were something other than what it is; and that the fact that the power system of today is a bipolar one has dominant implications of its own. The main trouble with a bipolar system, as a colleague has so tersely put it, is that the target is all too unambiguous. The admiral's statement reminds us also that concern with security is a concern with possibilities, and not necessarily with high probabilities or certainties.

Soviet-American Relations

Nevertheless, if the reason which the admiral gave were the only one which counted, there is no doubt that our attitudes and our efforts concerning security would be profoundly more relaxed than they are. There are special reasons residing in the character of the Soviet state (or, if one insists, in the difference between our two systems) and in the events resulting from that character (or difference in characters) which account for the special dangers and the present acute degree of tension.

There is not space here, or competence on the part of the writer, to permit any analysis of the character of the Soviet state or of Soviet-American relations during the past three years. Nor is such analysis necessary for our purpose. All we need to guide us are a few general observations which will be obvious when pointed out but which may nevertheless strike the reader as having some flavor of novelty.

First of all, one might suggest that students of international relations have perhaps muddied the waters unduly by a somewhat excessive concern with Soviet motives, particularly with the question whether the motives behind Soviet obstreperousness, and worse, are primarily defensive or aggressive. That is not to argue that motives are unimportant. Nor is it to complain that motives are always difficult if not impossible to fathom, which is certainly true. The psychoanalyst is obliged professionally to reach conclusions about motives, and it is noteworthy that his interpretations usually differ from those of the person whose behavior he is examining. What is being suggested here is simply 1, that the act may dwarf in importance, so far as counteraction is concerned, the motive from which it leaps; and 2, that a motive which stems from convictions which we cannot appreciably influence or alter by any reasonable acts on our part ceases thereby to be of much operational significance to us.

Implications of Soviet Philosophy of Foreign Relations

The significance of the facts that the Soviet Union is a police state and that its organizing ideology posits among other things the necessity of world revolution has been sufficiently elaborated elsewhere. But a point which is generally overlooked and which is of at least equal significance is the following: the distinctive ideology being all-pervading, it quite naturally includes a special interpretation of previously existing patterns of international relations. That fact means, among other things, that the reassuring analogies which one can draw from Western history concerning long periods of amicable relations between states of widely differing ideologies are of much diminished relevance. In almost all those instances we find ministers who otherwise represent the most widely differing persuasions holding a common approach to the conduct of foreign affairs, a common respect for the rules of the game.

Those rules, we are often told, elevated hypocrisy to the status of a first principle. "A diplomat," as the old saw goes, "is an honest man sent abroad to lie for his country." But there is another aphorism to the effect that hypocrisy has at least the merit of giving lip service to virtue. The "hypocrisy" of Western statesmen has frequently enough been self-deception. The constant appeal to higher principles in the instruments of diplomacy has almost always been something more than window dressing. The margin of difference between declaration and performance, though wide, nevertheless had limits which the statesman well understood and upon which he could base his expectations. It is a common pattern in all civilizations that behavior falls short of the aspirations reflected in the norms, but the norms are not thereby bereft of importance.

The Communist philosophy explicitly and systematically rejects the previously accepted norms of international conduct. The principle of expediency in the approach to the existing pattern is not simply indulged in, it is avowed and exalted.

The final and conclusive point relevant here is that the Soviet Union is a military state if not a militaristic one. Welfare, in the form of consumers goods and services, is subordinated to military requirements to a degree which also has probably never before been approximated in modern history—certainly not in Nazi Germany, which vaunted "guns before butter." While the milder kinds of Socialists have often been pacifists, no real Communist philosopher from Marx to the present has ever had the slightest use for pacifism. Marx, indeed, and Lenin too, took frequent occasion to bend their matchless scorn upon it.

Our Approach to Soviet Opportunism

The points just stated are not matters of opinion. They are the kind of conclusions which any normal intelligence operation provides, except that the factual evidence which supports them is far more abundant and incontrovertible than is usually available to the intelligence officer in his general run of problems. It is the kind of evidence upon which policy, as distinct from hope or yearning, must be based.

These conclusions do not point to the inevitability of war. They do point, however, to a policy the realization of which will at each recurrence of crisis serve to persuade the Soviet leaders that the expedient solution is the peaceful one. Such a policy would no doubt also serve to reduce the frequency of crises. For the saving grace of the Soviet philosophy so far as international relations are concerned is that, unlike the Nazi ideology, it incorporates within itself no time schedule. Hitler had to accomplish his ultimate goals not only within his lifetime but within his years of vigor. The Soviet attitude appears to be much more opportunistic. The Soviets may be unshakably convinced that ultimately there must be war between the Communist world and what they call the "capitalist" one. Since that conviction is a cardinal doctrine of their faith, we can probably do nothing within the present generation to alter it. What we can do, however, is to persuade them each time the question arises that "The time is not yet!"

Effect of Atomic Bomb on Our Policy

The problem to which we now return is the problem of how to accomplish this act of persuasion in an atomic age, when the already precious objective of peace is made immeasurably more precious by the immeasurably enhanced horror of the alternative. However, since preoccupation with the horror has brought us nothing positive thus far, and offers exceedingly little promise of doing so in the future, it is time for a shift to a more sober position. There are a large number of questions pressing for an answer, and consideration of many of them requires appraisal of the atomic bomb as an instrument of war—and hence of international politics—rather than as a visitation of a wrathful deity.

No doubt the first question concerns the effect of the atomic bomb upon the basic power relationship between the United States and the Soviet Union. Postponing for a moment such qualifying considerations as stem from our present but admittedly temporary monopoly, we see at once that one of the most fundamental changes created by the atomic bomb is that it makes possible *for the first time* decisive military action between the two great centers of power.

In a brilliant study published during the recent war, Professor William T. R. Fox based much of his analysis of Great Power relationships on the proposition that a war between the Anglo-American bloc on the one side and the Soviet Union on the other would be almost inevitably bound to result in a stalemate, and that common recognition of this fact by both

sides would powerfully influence (presumably for the better) relations between them. His explanation follows:

The pressure which either the Soviet Union or the Western powers can bring to bear upon the other in its main centers of power is surely much less than is implied by the statement that the two are the strongest forces in the world. Not only are the points of direct contact few and inaccessible but the centers are widely separated. The armed power of each can be effectively carried only part of the way to the other. American control over the seaward approaches to the New World will in any foreseeable future render a transoceanic operation by the Soviet Union impossible. The massive superiority of its land army should on the other hand discourage the Western powers from attempting a large-scale amphibious operation against hostile shores controlled by the Red Army.[1]

That proposition was not only true at the time of writing, but it could also be argued that no conceivable evolution of the instruments of war then publicly known could have significantly modified it. To be sure, strategic bombing was gradually developing in effectiveness, and the striking range of bomber aircraft was slowly but steadily increasing. However, with the experience of World War II, none but extremists could argue that strategic bombing was sufficient unto itself for winning a war against a great nation. Moreover, despite the increasing range of bomber aircraft, there were a variety of technical reasons, quite impressive in the aggregate, to support the conclusion that a comprehensive program of strategic bombing over what might be called intercontinental distances would not become practicable "in the foreseeable future." That conclusion assumed, of course, an evolutionary improvement in known types of bombs and incendiaries, roughly approximating in magnitude the developments of the preceding score of years. At any rate, it was as nearly certain as any military prediction can be that a conflict between the two major centers of power would be a prolonged one—comparable in duration to the two world wars—and not promising the same finality of decision achieved in each of those instances.

The atomic bomb has changed all that. Unless the number of atomic bombs which it is possible for any nation to make in, say, 10 years' time is far smaller than the most restrained estimates would indicate, there can no longer be any question of the "decisiveness" of a strategic bombing campaign waged primarily with atomic bombs. Also, for a variety of reasons which cannot be reviewed here but which are readily available elsewhere,[2] distance no longer presents the same kind of barrier to effective strategic bombing with atomic bombs that it does with chemical bombs. With atomic bombs, planes already in military service could effectively attack from bases within the continental United States important targets in the Soviet Union, which the same planes could not do if they carried only chemical bombs. Thus, there is no absolute necessity to wage great campaigns merely to secure advanced bombing bases. Finally, it is difficult to see how the decisive phases of a war fought with substantial numbers of atomic bombs could be anything but short.

The corollary of the point made in the previous paragraph is that the atomic bomb has deprived the United States of what amounted to absolute security against attack upon its continental territories. Its naval supremacy was sufficient to guarantee it both against direct invasion of hostile land forces and against enemy seizure of bases close to our frontiers for large-scale bombing attack. A potential enemy might count on token raids, but nothing more. America's invulnerability was akin to that which Britain enjoyed through the centuries until the perfecting of the submarine on the eve of World War I. The language which Francis Bacon applied to superior sea power in his own time, that it might take "as much or as little of a war as it liked," still largely held for the United States, alone among nations. But with effective intercontinental bombing available to any enemy who holds in substantial numbers the tools already in our hands, that treasured position is gone. The atomic bomb has in military effect translated the United States into a European Power.

Armament Competition and Security from War

However, though Heaven is lost, not all is lost. There is still the issue of superiority to contend with. Three questions especially concern us. Is clear and conspicuous military superiority possible in an age of atomic bombs? If so, is it possible for the United States to maintain it vis-a-vis its major rival? And what will be the political consequences of an effort to maintain atomic superiority?

It is not possible in a few paragraphs to do more than outline the nature of the problem contained in each of these questions and perhaps to indicate the fallacy of certain prevalent suppositions concerning it. Let us take the third question first.

There has long been a fashion among academic specialists in international relations to deprecate as futile and worse the quest on the part of any nation for military superiority over its rivals. As the argument runs, the attempt is bound to provoke a similar pursuit on the part of the rival, the net result being an armaments race which inevitably results in war. Historical support is of course not lacking, especially if the historical instances be chosen with discrimination. The prevalence of this doctrine has had a great deal to do with our frenetic pursuit of international control of atomic energy at almost any cost, including the cost of neglecting to consider any possible alternatives.

There is of course an important element of truth in the idea. But there is also much taken for granted in it which is not true. It is not true, for example, and has not been true at least since the industrial revolution began, that the so-called Great

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1. "The Super-Powers: The United States, Britain, and the Soviet Union—Their Responsibility for Peace." New York: Harcourt, Brace, 1944, p. 102.

2 See especially "The Absolute Weapon: Atomic Power and World Order," edited by Bernard Brodie (New York: Harcourt, Brace, 1946), p. 34-40; also "The Atomic Bomb and the Armed Services," by Bernard Brodie and Eilene Galloway, Public Affairs Bulletin No. 55 (Legislative Reference Service, Library of Congress), p. 42-45. The reasons why the same plane can be effective over much greater distances with atomic bombs than with chemical bombs concern basically the intricate relationships between such factors as the amount of bombs which a plane can carry over any given distance, the total military effort expended in carrying it over that distance, and the tolerable rate of loss of attacking planes. Since the atomic bomb does enormously more damage than an equivalent load of chemical bombs, the cost per sortie which is acceptable with atomic bombs is also proportionately greater —great enough, in fact, to include 100 percent loss of planes on successful attacks. The greater acceptable cost; that fact that the plane itself need not be retrieved (whatever the arrangements made for the rescue of the crew); and the additional fact that a single atomic bomb, whatever its weight, is always a sufficient payload for any distance which the plane is capable of carrying it, will have the effect of at least doubling the maximum effective bombing range of any plane of B-29 size or greater.

Powers have been on an approximately equal footing in terms of their ability to compete in the production of those instruments of war that really counted. It could be said, for example, that it was the Washington Naval Treaty of 1922 which made the Pacific phase of World War II possible, for it assured to Japan something much closer to naval parity with the United States than would have been anywhere near her reach in any real building competition ensuing from the absence of such a treaty. The Treaty did avoid for a time a "costly" naval building competition. But was not the war with Japan immeasurably more costly? And would Japan have dared embark upon a war against an America boasting a naval power which was—as it easily could have been, without any untoward strain upon the American economy—two or three times her own?

General propositions should not be pushed too far, including the one just stated, but there is much cant in the field of international studies which needs to be brushed out. Those to whom armaments competition appears disastrous as well as wicked are somewhat inconsistent when they look back nostalgically on the relatively peaceful nineteenth century and on the marvelous role played by Great Britain in helping to preserve that peace. They will speak vaguely of Britain's invulnerability as a contributing factor, as though that invulnerability were something handed down from on high. It was indeed Britain's invulnerability at home which enabled British statesmen to play such an active and on the whole beneficent part in helping preserve the peace of Europe, but it was not simply the accident of the Channel which made Britain invulnerable. It was her clear-cut naval superiority over the Channel and adjacent seas, *the impairment of which Britain would not brook*, which gave her that enviable position.

Feasibility of Maintaining Bomb Superiority

Returning again to the atomic bomb, the issue is not whether our country ought to seek to maintain its present superiority in atomic armaments but whether it has any chance at all of succeeding in such an effort. It has been argued by some (including at one time the present writer) that it was in the very nature of atomic armaments that the kind of clear and decisive military superiority that was feasible in the past—conspicuously in the case of naval armaments—could no longer be realized. The argument was based fundamentally on two considerations: first, that there was "no defense against the atomic bomb," and second, that when a nation had enough bombs to overwhelm its opponent in one surprise attack and was willing to make such attack, it would make little difference whether its opponent had two or three times the number.

There is now reason to believe that the situation is not so simple as all that. A great deal depends on the total number of bombs which it will be possible for the various Great Powers to make in any given period of time. Clearly, a three to one superiority in numbers of bombs would mean one thing if the numbers of bombs on each side were numbered at most in the scores or hundreds, and something quite different (and much less significant) if they were numbered in the thousands. Information which would enable private citizens to make intelligent estimates concerning rate of bomb production has not been made public, but there appear to be hints in various quarters that the maximum feasible rate of bomb production is substantially less than was being generally assumed two years ago. It is also clear that the richer of the known deposits of uranium and thorium are much more accessible to the United States than to the Soviet Union.

One may also assume that the enormous technological lead which the United States has over the Soviet Union—and which shows no conclusive signs of diminishing—is bound to mean a great potential advantage for the United States in the design of the instruments for using the atomic bomb. The bomb by itself has no military utility. It must be delivered to the target in some kind of vehicle which, unless it is a free-flying rocket, is subject to various kinds of attack. Marked superiority in the vehicle or in the means of shooting down the enemy's vehicles may be no less important than superiority in numbers of bombs, especially if those numbers are something less than gigantic. If those several types of superiority are concentrated on the same side, the disparity in atomic fighting power may be sufficient to warrant comparison with outright monopoly.

The Soviet Union has been able, with the assistance of German technicians, to build several types of jet-propelled fighters, and she has also built several large bombers patterned after our B-29, some models of which were impounded by her during the war. But a few German technicians are not going to make the difference between a backward technology and an eagerly progressive one. Our lead in types of aircraft, in the ordnance of combat aviation, and in anti-aircraft matériel should, or rather could, be as great during the next 20 years as it was in the recent war. The only question is whether we will make the necessary effort to keep in the lead in our military technology. That the Soviet Union will spare no effort within her capabilities to overtake us goes without saying.

Military Superiority as a Diplomatic Weapon

We are often told that our *monopoly* of the atomic bomb is a wasting asset. It is, to be sure, in the sense that some day it is bound to end and we are constantly getting closer to that day. But is our *superiority* similarly a wasting asset? In one respect, at least, we know that it is not, for our fund of bombs is increasing steadily during the period in which the Soviet Union remains without any. On the day that the Soviet Union produces its first bomb, we will have many more than we do at present. What happens thereafter depends on a large number of variables. But looking forward from the present, we may say with a good deal of assurance that our present superiority in atomic armaments will increase considerably before it begins to wane, that it may continue to increase even after the Soviet Union is producing bombs, and that it may be a long time in waning thereafter. At any rate, we know that merely to distinguish—as is usually done—between the monopoly period (in which we are safe) and the post-monopoly period (in which we are lost) is not enough.

One might incidentally point out that it is easy to be oversubtle concerning the political consequences of our present monopoly of the bomb. The duty of the intellectual to get behind the obvious too often betrays

him into ignoring the obvious or even denying it. We have heard a good many references to the fact that the atomic bomb, being a weapon of mass destruction, is not really handy for diplomatic manoeuvering. We have been told also that since we would never use it against cities inhabited by friendly peoples, it would not help us one whit in stopping Soviet armies from overrunning Western Europe. The latter observation happens not to be strategically correct, since the destruction of *Russian* cities and industries would make a great deal of difference in the ability of the Soviet armies to overrun Western Europe, or to maintain themselves in that area if they got there. But the fact remains that the atomic bomb is today our *only* means for throwing substantial power immediately against the Soviet Union in the event of flagrant Soviet aggression. The Soviets may underestimate the power of the bomb (as may, indeed, our own military leaders), but they cannot be entirely oblivious of that fact. If they choose war now it will be either because they underestimate the bomb even more grossly than they appear to or because they would rather face the hazard now when our bombs are few than later when they are many.

Concerning the effects of the atomic bomb upon our military organization and strategic plans, we must recognize first of all that, to paraphrase Clemenceau, the matter is much too important to be left to the generals—or to the politicians either for that matter. Formulation of security policy demands anticipation of probabilities with due regard to what is politically possible or feasible. But consideration of the latter may too easily degenerate into preoccupation with what is politically safe. Political leaders, moreover, have neither the time nor the inclination to preoccupy themselves with the long-term significance of changes in military technology, and rarely the competence to make anything of it if they do. They must rely upon the advice of their military aides, who belong to a profession long recognized as markedly conservative—though it is easy to exaggerate the degree and character of that conservatism—who have vested service and personal interests which influence them consciously or unconsciously, whose talents are not primarily dialectic, and who are saddled with tremendous responsibility. The responsibility powerfully reinforces the conservative tendencies already present as a result of nurture and training. We are therefore not likely to find military leaders, or the civilian officials whom they advise, accepting readily upon the advent of some revolutionary military device that drastic adjustment which free and objective inquiry may indicate as necessary or at least desirable.

Estimates of the Bomb's Strategic Effectiveness

It is a little startling, some three years after Hiroshima, to find the military departments of our government still apparently unprepared to think in terms of what strategic effects are to be expected from the use of any given number of bombs. The national safety will of course demand close secrecy concerning conclusions reached, but in this instance there is reason for believing that "security" is concealing the absence of thinking rather than the import of the ideas derived. For example, in the paper prepared by the War Department in March 1947 on "The Effects of the Atomic Bomb on National Security," there is a reference to something called a "significant" number of bombs. The meaning of "significant" is then explained only as indicating that number of bombs which would "provide an important military capability."[3] The military profession is not the only one which habitually betrays itself with catch phrases, but when we think of the absence of logic usually inherent in such sacrosanct phrases as "balanced fleet" or "balanced force," we cannot be too optimistic about the precision of thought behind the "important military capability."

We know that one bomb will not win a war against a major Power, since it took two to produce the surrender of an already defeated Japan. The same may reasonably be held to be true of five or ten. But there appears to be little idea anywhere what number would be "significant" and even less conception of how many it takes to make the weapon "decisive." Much will of course depend on how the bombs are used, but then the significance of the whole issue is that the number available and the estimates concerning the capabilities of that number will in large part govern the way in which they are used.

It is not easy to extrapolate the strategic effectiveness of atomic bombs from the experience with strategic bombing gained in the recent war. There are too many differences, besides that of magnitude of destruction per bomb or per plane, between bombing with chemical bombs and attacking with atomic bombs. It is not even a simple matter to determine the factor of increase in power of the atomic bomb over an equivalent load of chemical bombs. But we do have enough data to provide the basis for some intensive research which might throw some light on the problem. What we need to know is: "How many bombs will do what?" And the "what" must be reckoned in over-all strategic results rather than merely in acres destroyed.

The evidence is presumptive only, but nevertheless impressive, that our military planners are thinking of an atomic bomb which is an "important military capability" but nevertheless only an ancillary rather than a decisive weapon. The chief danger is that the inevitably transitory nature of the conditions presumed will not be recognized sufficiently or in time. Regardless of what the Soviet Union may accomplish in the field, our own production of atomic bombs is proceeding apace, and the justification for regarding the weapon as an ancillary one is bound to evaporate as our stockpile accumulates.

Cost of Preparedness in Its Broader Aspects

If we consider national defense policy in its broader aspects, and look beyond the period of American monopoly of atomic weapons, we see that recognition of the loss of American invulnerability to overseas attack and expectation of quick decisions in the event of war will no doubt entail a violent wrench to our defense traditions. Preparedness in the old sense of the term, which meant mainly provision for great expansion of the military services and of military production after the outbreak of hostilities, will appear even less adequate than it has been charged with being in the past. What will that mean for the costs of military preparedness?

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3 The War Department Paper was published in the Public Affairs Bulletin No. 55 already cited. The specific reference above is to page 67 of the Bulletin.

Unquestionably the costs will increase, as they have already begun to. But we should not assume that the restraints which have always operated on the growth of military budgets will become inconsequential. There have been no systematic studies of the various factors governing the size of military budgets. It is obvious that periods of international tensions generally stimulate increases in military expenditure, and historians have dwelt on the scale of the armaments races preceding the two world wars. But they have scarcely considered the significance of the fact that in each case the extent of the arming, though large in comparison with more tranquil periods, was relatively small in contrast to the expansion of the war period itself.

Living with the Bomb

We are speaking here partly of ordinary human inertia, even under circumstances where war appears imminent, and in so far as that inertia can be relied upon to be both pronounced and universal it should definitely enter into our calculations. But there is more to the matter than simple inertia. Wartime economies are characteristically fat-consuming. Both the toleration of them by the public and the physical possibility of maintaining their inordinate pace depend on the fact that they are temporary and recognized to be such. If there is to be fat to consume it must first be accumulated. In other words, even from the point of view strictly of defense needs, war economies can be inaugurated too soon as well as too late. And if the relevant comments of General Eisenhower while he was Chief of Staff of the Army can be taken as representative, that fact is recognized by the military themselves.

There is also the problem of avoiding military expenditure which is improvident not only because it is too large but also because it is misdirected. We have heard much, for example, of the business of dispersing our cities as a defense against atomic attack. It is clear that such dispersion would result in a tremendous loss of fixed and sunk capital and, in all probability, in a less efficient spatial arrangement of industries than previously existed. Thus, even if one should make the wholly untenable assumption that wholesale dispersion of our cities and the losses resulting would be tolerated by the public, the project might still appear to be militarily wasteful. A great many combat airplanes could be provided with what it would cost to disperse even a relatively small city. There is no doubt a margin for the dispersion of key industries and services which would not loom large in terms of the economy as a whole but which would nevertheless have important security results. If so, the accomplishment of that objective should remain a maximum as well as a minimum goal.

These observations are of course not very reassuring to those who, like the present writer, deplore the necessity of spending on military protection even so substantial a portion of our national income as we are spending today. The limits referred to are fairly flexible and we are still far from having reached them. And what will occur in this country when the conviction settles upon it that the Soviet Union is producing atomic bombs is the big question of the future. But the error for which we are now paying was after all perpetrated some three centuries ago, when Galileo was permitted to escape burning. Our problem now is to develop the habit of living with the atomic bomb, and the very incomprehensibility of the potential catastrophe inherent in it may well make that task easier.

Science and Politics in Russia

(Continued from Page 368)

Lysenko's report at this session on the state of affairs in biology was approved by the Central Committee of the Communist Party of the Soviet Union and expresses the line of the Bolshevik Party."

A number of Lysenko's opponents confessed their "errors" and recanted their belief in Mendelian heredity; several others were dismissed from scientific positions or had their laboratories abolished. *Pravda* made the basic question clear: "Is the inheritance of characteristics and features, acquired by plant and animal organisms during their lifetime, possible?" As far as Russia is concerned, the question has been settled, not in the usual way by a consensus of scientific observation and experiment, but by a political decree.

Because scientists in other countries have come to opposing conclusions, one is led to ask whether scientific evidence exists in Russia of which other scientists are ignorant. Two British botanists, Hudson and Richens, have read, digested and summarized in English everything published by Lysenko and his collaborators up to 1946. They found no such evidence.

There must, therefore, be political reasons for the political decision. These are also revealed in the *Pravda* editorial, which labeled the opposing trends as, on the one hand, "the Michurin trend—progressive, materialist, Soviet" and on the other, "the Mendel-Morgan-Weissman trend—reactionary, idealist, bourgeois."

Moreover, the "orthodox" Russian geneticists have been castigated as guilty of "un-Soviet activities" in listening sympathetically to foreign scientists. This type of isolationism is not unknown outside of Russia, and American scientists who participate in world studies, as they must, occasionally have to fear the charge of "Un-American activities."

Some people have been apprehensive that official Communist approval and acceptance of Lysenko's views might lead to a Soviet situation similar to that which obtained in Nazi Germany, in which genetics was used to buttress a particular approach to racial differences. Apart from the danger of deciding a scientific question by fiat, the decision in this case would appear to put the Soviet Union in direct opposition to the Nazi theory.

The Nazis proclaimed that blood was all-powerful, that there could be no cure for having parents of the wrong racial stock. The Russians take the opposite view—hereditary differences are unimportant as compared to the powerful effects of environment. Although there seems to be no experimental justification for this view, it has never lacked friends among those in all countries to whom the apparent determinism of heredity is philosophically repugnant. The warmest defenders of the doctrine of the inheritance of acquired characteristics have always been those who most wanted it to be true, either to explain the evolution of creatures long since dead, or to make a better future for those not yet born.

Those who have dealt with the matter at first hand, however, have failed to convince their fellow-biologists, and generally themselves as well, that heredity changes in any way except by mutation.

FAS LOYALTY COMMITTEE SUMMARIZES CLEARANCE PROCEDURES

The Scientists' Committee on Loyalty Problems, recently appointed by the FAS, has prepared a summary of clearance procedures, a digest of which follows:

Loyalty Clearance—Employees

The cornerstone of present loyalty clearance procedures is the President's Order of March 21, 1947. The head of each department and agency is responsible for investigations of all employees and for setting up loyalty boards. Written charges are required; rights are granted to an administrative hearing and to choice of council, and of appeal to the Civil Service Commission Review Board.

An investigative agency may refuse to disclose the names of confidential informants. The activities which may be considered in determining loyalty include, sabotage, treason, or sympathetic association with organizations declared totalitarian, fascist, communist, or subversive by the Attorney General.

The Loyalty Board of the Civil Service Commission issued regulations which provide (1) the employee may be present at the hearing with his counsel (2) the employee has similar rights in the appeal to the Loyalty Review Board, (3) a copy of the transcript of the hearing before the department loyalty board shall be given the employee upon request, (4) employees may not be suspended untill an initial unfavorable determination has been made, except in cases seriously threatening national security, (5) the agency boards may permit the employee to resign.

The Hatch Act makes it unlawful for any government employee to have membership in any party or organization advocating the overthrow of our form of government; the penalty is immediate removal. Also, several appropriation acts prohibit the use of funds to pay the wages of persons who advocate, or are members of organizations which advocate, the overthrow of the government by force and violence.

The Department of Commerce, which includes the Bureau of Standards, the Civil Aeronautics Administration, the Weather Bureau, and the Coast and Geodetic Survey, set up a Loyalty Board which reviews all employee records and conducts hearings. It contains all the relevant provisions of the Executive Order and the Loyalty Review Board.

The Department of the Interior, the Federal Security Agency, and the Federal Communications Commission, have all established similar boards.

The Army does not have loyalty clearance procedures, but security clearance is required of all civilian employees.

The Navy distinguishes between loyalty and security cases and has separate procedures for each. The screening of employee records is carried out by administrative officers and hearings are conducted by the Departmental Loyalty Board.

No information on procedures has been received from the Air Force.

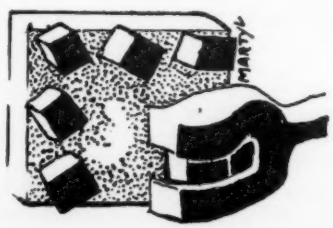
Security Clearance—Employees

By legislative action, the power of summary removal has been granted to the heads of the War and Navy Departments, the State Department, the Central Intelligence Agency, and the AEC, which are considered "sensitive security areas". Since such removal of employees is authorized in the "interests of national security", the clearance required for employees in these departments is called security clearance. This is the legal distinction between security cases and loyalty cases. Security clearance is not necessarily required for all the employees of the above departments and agencies, but, when it is not required, loyalty clearance is.

Power of summary removal of civil service employees is given to the Secretaries of War and Navy, provided that the person discharged shall have the right to "be fully informed of the reasons".

The decision may be appealed to the Army's Security Review Board; the employee has a right to a hearing, may be represented by counsel, and may present evidence and introduce witnesses (this is the only hearing given the employee). The decision is sent to the Secretary of the Army for final action.

Similar procedure applies to Navy employees; the employee is given the right to make a personal appearance before the activity head but no hearings are provided.



No information on procedures has been received from the Air Force.

The Atomic Energy Act of 1946 is less explicit than other statutes in conferring the power of summary removal. However, it states, ". . . The Commission shall make adequate provisions for administrative review of any determination to dismiss any employee", and that no person shall be given access to restricted data until the F.B.I. has made a report to the Commission.

No procedures were announced by the AEC until April 15, 1948, when its "Interim Prcoedure" was issued. The Manager of Directed Operations concerned makes preliminary decisions and notifies an employee of his interim status and of the charges against him, in case the decision is unfavorable. The employee is given the right to appear before the local Personnel Security Board with or without counsel of his own choosing, and to present evidence through witnesses and documents. In case the local Board recommends that security clearance not be granted, the employee may appeal to the Personnel Security Review Board.

Loyalty Clearance—Applicants

The regulations of the Loyalty Review Board prescribe the same procedures for "applicants" as for "appointees". Preliminary investigations and hearings are conducted by a regional loyalty board of the Civil Service Commission.

Special Provisions of Atomic Energy Act

The Atomic Energy Act of 1946 (Public Law 585—79th Congress), in Section 10 (b) (5) (B) (i), required that no contract, agreement, or loan shall be made until it has been agreed in writing that no person will have access to restricted data until the F.B.I. has reported to the Commission on that person and the Commission has determined that such access will not endanger national security.

The "Interim Procedure" of April 15, 1948 (discussed in Part II. E above) applies" . . . to contractors' and licensees' employed subject to security clearance under the Atomic Energy Act of 1946".

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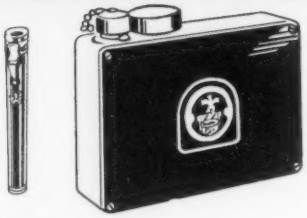

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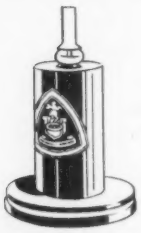

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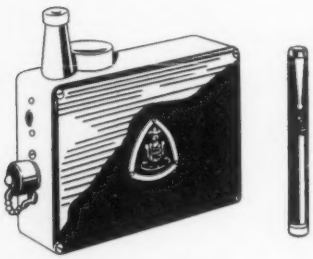

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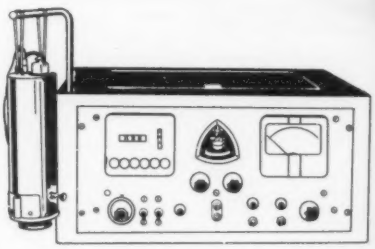

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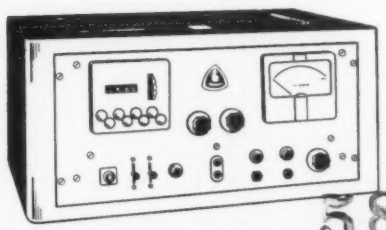

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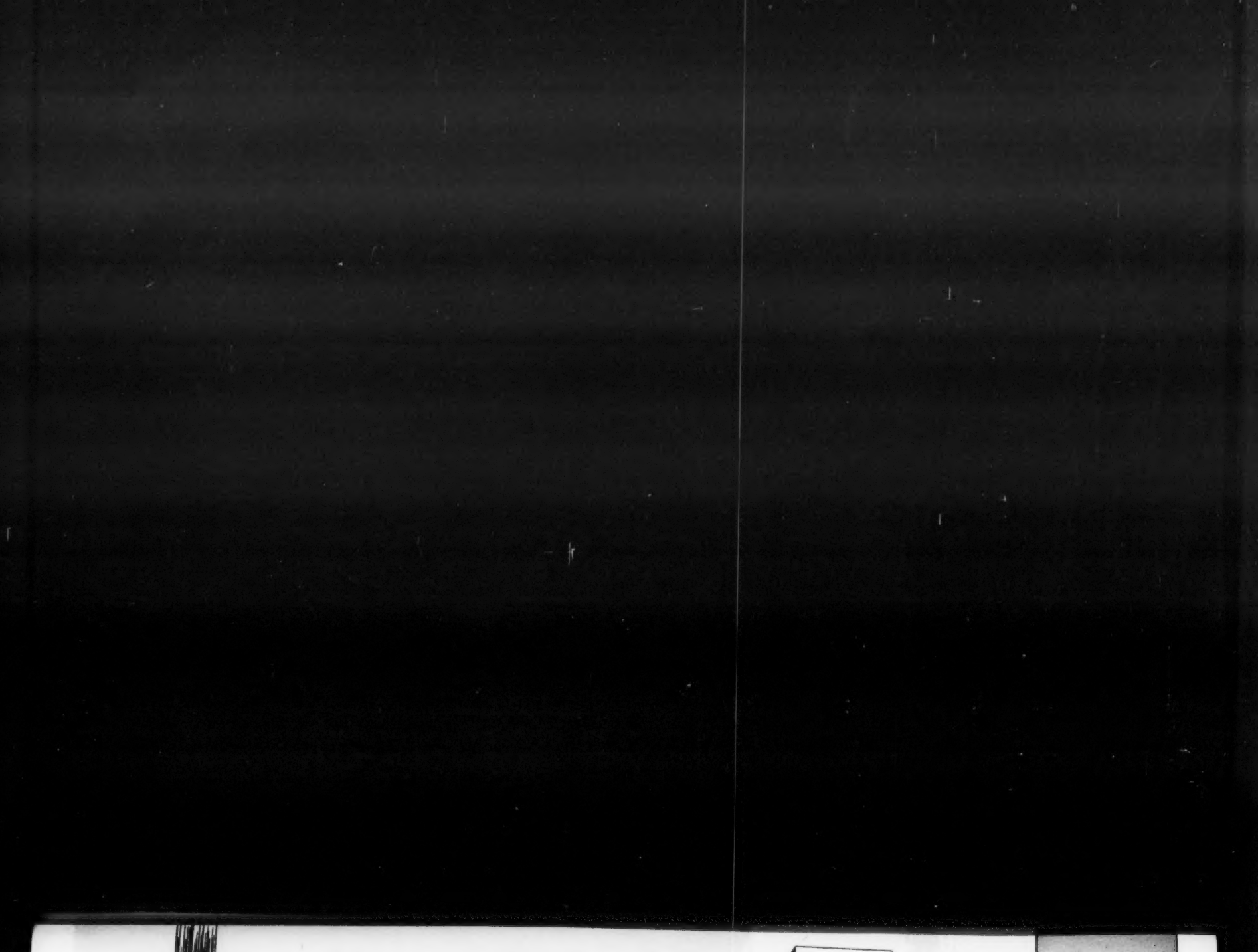
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